Issue #306

March 1986
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73 for Radio Amateurs®

A WGE Publication

International Edition

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- Extra FT-107 Memory
- One-Touch Speed Dialer
- Simple IC Trainer

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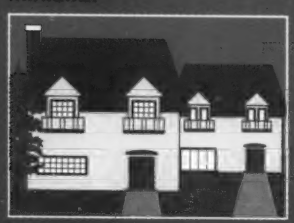
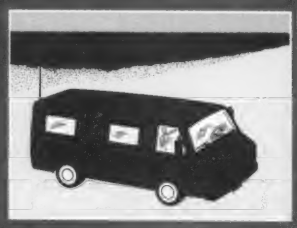
ICOM Automatic HF Antenna Tuner

AH-2

ICOM presents the AH-2 automatic antenna tuning system for the IC-735 all band HF transceiver. The AH-2 is ideal for mobile operators since there is no manual antenna tuning needed...an advantage in inclement weather. Also, the AH-2 system enables auto tuning in areas where antennas are limited, such as apartments and condominiums.



The ICOM AH-2 System combines advanced matching techniques and rugged construction for indoor or outdoor



use to match frequencies from 3.5MHz to 30MHz. The system includes an antenna element, and the AH-2a tuner and controller units.

The AH-2a Tuner Unit enables optimum matching conditions via its built-in 8-bit microcomputer and LC (coil/capacitor) circuit. More than 260,000 LC combinations are possible.

The AH-2a Controller Unit easily attaches to the side of the IC-735 HF transceiver. By simply pushing the TUNE button on the front panel of the AH-2a controller unit, the controller automatically tunes from 10 to 80 meters in less than six seconds. It can also be used on the 160 meter band with an extension of the stainless steel whip.

The AH-2a tuning unit is housed in a durable weather-resistant case and is capable of storing tuning information for eight different frequencies. Retreiving tuning data from the memories is accomplished in less than one second!

The AH-2a can be purchased separately to accommodate the ham who already has a bumper mount and whip antenna, or the apartment/condo dweller who wants to match a random wire.

The antenna element includes sturdy bumper mounts which hold the 107 inch stainless steel whip in place, plus all the necessary hardware.

For the ideal mobile station, look at the IC-735 transceiver and the AH-2 automatic antenna system...they're quite a match.

ICOM

First In Communications

ICOM America, Inc. 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. AH21285

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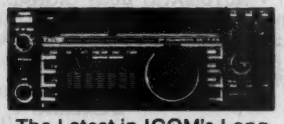
ICOM IC-735



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PRIVATE PATCH III offers about the same capability, performance and features as their top model but is priced closer to their bottom of the line (SP) model!

So why settle for SP when top of the line costs little more?

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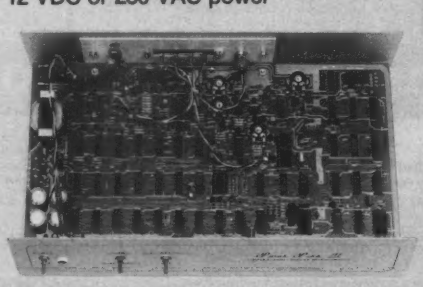

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THINGS TO LOOK FOR *(AND LOOK OUT FOR)* IN A PHONE PATCH

- One year warranty.
- A patch should work with any radio. AM, FM, ACSB, relay switched or synthesized.
- Patch performance should not be dependent on the T/R speed of your radio.
- Your patch should sound just like your home phone.
- There should not be any sampling noises to distract you and rob important syllables. The best phone patches do not use the cheap sampling method. (Did you know that the competition uses VOX rather than sampling in their $1000 commercial model?)
- A patch should disconnect automatically if the number dialed is busy.
- A patch should be flexible. You should be able to use it simplex, repeater aided simplex, or semi-duplex.
- A patch should allow you to manually connect any mobile or HT on your local repeater to the phone system for a fully automatic conversation. Someone may need to report an emergency!
- A patch should not become erratic when the mobile is noisy.
- You should be able to use a power amplifier on your base to extend range.
- You should be able to connect a patch to the MIC and EXT. speaker jack of your radio for a quick and effortless interface.
- You should be able to connect a patch to three points inside your radio (VOL high side, PTT, MIC) so that the patch does not interfere with the use of the radio and the VOL. and SQ. settings do not affect the patch.
- A patch should have MOV lightning protectors.
- Your patch should be made in the USA where consultation and factory service are immediately available. **(Beware of an inferior offshore copy of our former PRIVATE PATCH II.)**

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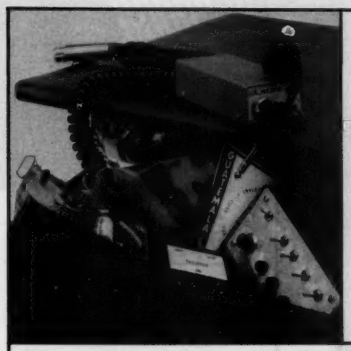
PRIVATE PATCH III
GIVES YOU ALL OF THE ABOVE



73 for Radio Amateurs®

ISSUE #306 MARCH 1986

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Gadgets, gadgets and more for the tinkerer! And yes, Wayne's back. Photography by Frank Cordelle, Bennington, NH.

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That annoying ac hum is robbing you of pleasure. Fix it in an hour with WA4WDL's seven-piece filter. WA4WDL

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50 Instruction Instructions
Discover hidden savings in the last place you'd ever look—the instruction manual. N6HYK

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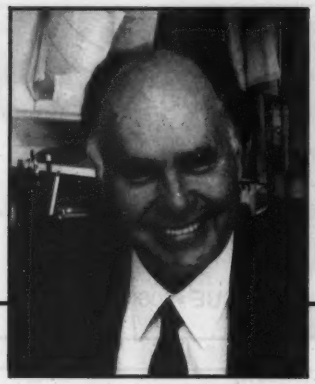
NEVER SAY DIE



WELL, I'M BACK

I'm deeply concerned about a type of mental illness, spread by hams, which is going around. It's not a new one—actually, it's shown signs of dying out in recent years. It's a virus-like illness which can hit people at any age, but which tends particularly to hit boys around puberty. For the lack of a better name, I call it the Ham Infection—HI.

I remember the first time I was exposed to it. I was about ten and my grandfather introduced me to Fred Stevenson W1CUN. Fred was slouched in a little building out in back of the Valley View Hotel in Bethlehem, New Hampshire, his legs intertwined in a chair, with his obviously home-made ham rig, built on a board, blazing away as he talked. I can still see it. And how incredible that 15 years later I'd be operating my own ham station from this very same shack.

You can bet I began tuning any radio with a shortwave band on it up above the broadcast band—past the police calls at 1600 kHz—to hear the hams talking on the 160-meter band. Wow! I'd been infected.

Oh, I suppose I was predisposed. My mother's father was an inventor—made over a million at it back in the 20s when that was a lot of money. He was into the high tech of his day—invented the first thermostat for gas stoves, for instance. My father was into flying, the high tech of his day. So I was a sitting duck when Fred happened to me.

Now, every one of you reading this is a carrier of this mental illness. Yes, you have the power to infect dozens—even hundreds—of susceptible youngsters. I've known some hams, like Bill Welsh W6DDB, to infect thousands. He even infected his wife, Marie W6JEP! Women, for some reason, are usually resistant to HI.

Speaking of wives, I realize that many of them think of HI as a dread illness, one which siphons money from the family income for expensive ham rigs and ugly towers with sprouting antennas to make their homes eyesores in the neighborhood. The accompanying TVI alienates many of the neighbors. Heck, she can't even get the OM to go to work if a rare country he hasn't contacted is scheduled to be on the air. And then there are all those weirdos who track dirt through her living room, going into the hamshack to talk gibberish!

The Ham Infection is different from most mental aberrations, such as religion and politics, both of which require extensive exposure to become established. The Ham Infection can happen in minutes—and last a lifetime. It's in some ways like narcotics or alcohol in that those of us who have it enjoy it—it's our families and friends who suffer.

The answer to that problem is simple—infect as many of your family and friends as you can. Then you'll all enjoy the madness together. Let's get together on this and pool our resources. I know some ways to spread HI, but I'll bet you know many ways I haven't thought of yet. So drop me a note with your suggestions on what you've found successful.

Remember, our mental problem is only an aberration because there are so few of us—less than 0.2% of the US population. In Japan, where about 1.6% have HI, it's almost respectable. It looks as if we might begin to see daylight at around 1%—about 2.2 million licensed hams. That's a good goal, right?

Not to throw cold water on you CW fanatics, but if Fred had been batting a key around instead of talking over his ham rig back in 1931, I'd probably be a lawyer today. And heaven knows we sure don't need another lawyer. Some of my best friends are lawyers, but I sure wouldn't want my daughter to marry one.

Continued on page 67

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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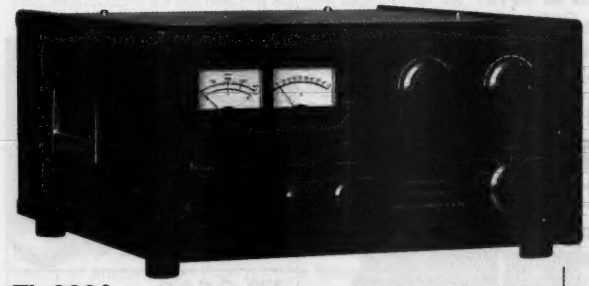
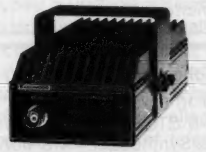


TL-922A 160-15 m 2 KW PEP/1 KW DC Input Linear Amplifier. Pair of EIMAC 3-500Z tubes and excellent IMD characteristics. Perfect safety protection with blower turn-off delay circuit.

PC-1A Phone Patch (FCC Part 68 registered).

MA-5 80/40/20/15/10 meter mobile antenna. All resonators supplied. 200 W PEP max., VSWR 1.5:1 or less. Easily adjustable for center frequencies.

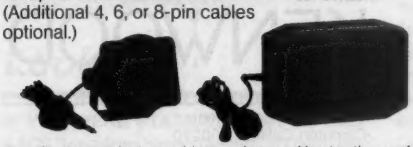
VP-1 Bumper mount for above.



VB-2530 25 W RF Power Amplifier (for TR-2600A). BNC-BNC cable, and mounting bracket supplied.

MC-85 (8-pin) Multi-function desk-top microphone (8-pin) 700 Ω unidirectional electret condenser mic. Built-in audio level compensation with output and tone control, meter, and UP/DOWN switch. Selector switch for up to three transceivers. (Additional 4, 6, or 8-pin cables optional.)

MC-60A (8-pin) Deluxe desk-top microphone. Pre-amp built-in, PTT, LOCK and UP/DOWN switches. Hi/Lo Z selector switch.



SP-40 Compact mobile speaker.

SP-50 Mobile speaker.

SM-220 Station monitor/10 MHz oscilloscope Pan display capability with optional BS-8 (for TS-940S, TS-830S). Monitor transmitted waveforms and/or received signal waveforms. Built-in 2-tone generator.

HS-5 Deluxe headphones.

HS-6 Lightweight headphones.

LF-30A Low pass filter. 1 kW, 50 Ω. Insertion loss: less than 0.5dB at 30 MHz.

MA-4000 2 m/70 cm dual band mobile gain antenna. Duplexer supplied. Ideal for use with the TW-4000A "Dual Bander" and TM-211A/TM-411A. (Mount not supplied.)

AL-2 Lightning and static arrester. 1 kW, 50 Ω.

Not Shown:

MC-50 Desk-top microphone. Hi/Lo Z. 4-pin connector.

MC-80 Desk-top microphone. 700 Ω unidirectional electret element with flexible boom. Built-in mic. pre-amp and UP/DOWN switch, with lock. (8-pin).

MC-48 Hand microphone with 16-key DTMF pad and UP/DOWN switches. (8-pin).

MC-46 As above, but with 6-pin connector.

MC-42S Hand microphone with UP/DOWN switches. (8-pin).

MC-35S Noise cancelling hand microphone, 50 k Ω (4-pin).

MC-30S As above, but 500 Ω.

PG-4A Microphone cable for MC-60A. Converts MC-60A to 4-pin connector.

PG-4B As above, but 6-pin.

PG-4C As above, but 8-pin, as supplied with MC-60A.

PG-4D Extra 4-pin cable for MC-85.

PG-4E As above, but 6-pin.

PG-4F As above, but 8-pin.

HS-7 Micro-headphones.

KPS-7A 13.8 V DC, 7.5 A intermittent DC power supply.

RA-3 2 m, 3/8 λ telescoping antenna with BNC connector.

RA-5 2 m 1/4 λ /70 cm 5/8 λ telescoping antenna with BNC connector.

RA-8B 2 m StubbyDuk® with BNC connector.

RA-9B As above, for 220 MHz.

RA-10B As above, for 440 MHz.

RD-20 Dummy load, 50 Ω DC-500 MHz 20 W continuous, 50 W intermittent.

PG-3A DC line filter for mobile use.

Service manuals are available for all Kenwood transceivers and most accessories.

KENWOOD

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1111 West Walnut Street
Compton, California 90220

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KENWOOD

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TR-9130

TR-9130 2 meter all mode

The TR-9130 is a compact rig that gives you 25 watts of RF power on all modes!! You can select your tuning steps from 100-Hz, 1-kHz, 5-kHz or 10-kHz. With six memories, you can program your favorite frequencies! (FM 1-5 Simplex or ±600-kHz offset, memory 6 non-standard offset, all six for simplex, any mode!) Dual digital VFO's, and transmit frequency tuning enhance OSCAR operations.

Internal battery back-up (9 V Ni-Cd not Kenwood supplied) retains memories for approximately 24 hours, in case you operate mobile and base!

Other convenient features such as automatic band scan, squelch circuit for FM/SSB/CW, tone switch, repeater reverse switch, CW semi break-in; sidetone, high performance noise blanker HI (25) LOW (5) power switch (FM/CW) RF gain control, and RIT circuit further enhance this expressive package!

Optional accessories:

- KPS-7A AC power supply.
- PS-20 AC power supply (TR-9500 only).
- BO-9A system base with memory back-up supply.
- SP-120 external speaker.
- TK-1 AC adapter for memory back-up.
- SP-40 mobile speaker.
- SP-50 mobile speaker.
- SW-100 A/B power meters.
- MC-55 Mobile Mic w/time-out timer.

TR-9500

70 CM SSB/CW/FM transceiver

- Covers 430-440 MHz, in steps of 100-Hz, 1-kHz, 5-kHz, 25-kHz or 1-MHz.
- CW-FM Hi—10 W, Low—1 W. SSB 10 W.
- Automatic band/memory scan. Search of selected 10-kHz segments on SSB/CW.
- 6 memory channels.

TS-711A/TS-811A

Multi-function all-mode 2 m and 70 cm transceivers.

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QRX. . .

EDITED BY PERRY DONHAM KW1O

RM-5241

DON STONER W6TNS has filed a Petition for Rulemaking with the Federal Communications Commission which would establish a **Public Digital Radio Service** in the amateur six-meter band. In his (very convincing!) petition, Stoner outlines the need for the new allocation by describing the explosive growth in the use of modems, the plummeting price of personal computers, and the sharp increase in the cost of accessing the telephone network. Don believes that these three factors make the time ripe for a low-power digital service. Why six meters? According to Stoner, "Out of 400,000 radio amateurs in the United States, less than 1,000 are active in the six-meter band." He goes on to state that, due to the potential for interference to TV Channel 2, nearly all amateur operation is in the lower 2 MHz of the amateur band (50–52 MHz). It is the band from 52 to 54 MHz that Don wants to use for the new service. The technical specifications for the PDRS are very stringent and specific: 1 Watt maximum transmitter output, use of only vertical antennas, and prohibition of remuneration are a few of the details that are laid out in the document. The channel usage would be very similar to our own packet-radio system, with only one channel being occupied by multiple stations using collision-avoidance schemes. Is it really time for a digital Citizens Band? I say it is. The ARRL's "Super Novice" ticket will fill a void in the amateur structure, but a new license-free computer-to-computer allocation is something that millions of telecommunicating Americans are hungry for. The FCC has assigned Stoner's petition RM-5241.

FEMA Fans

A PAIR OF HAMS from the Westchester (NY) Emergency Communications Association recently let their government know just how important amateur radio can be in a disaster. **Rich Moseson N2BFG and Don Storm K2MQR** spoke before a disaster-preparedness seminar sponsored by the Federal Emergency Management Agency. The talk included a video tape of hams performing emergency communications during disasters in California, and a handout containing names and telephone numbers of local amateur emergency personnel. Several seminar participants claimed that the duo's presentation was "the most interesting and educational of the day."

Looking

IF YOU WERE STATIONED with the **14th AACS Squadron** headquartered in Cairo during World War II, it's reunion time! Get in touch with one of these fellows for details: Bob Irons W9CSJ, Bill Eller K9OIW, Ted Werling WA9OPJ, Paul Baumgarte WD8RJR, Chuck Cohen W2FQ, Art Masters N4LZX, Bill Ulbright W9LLQ, or John Fisher W1CLF.

CQ Ma Bell

WE MISSED THE BOAT on the no-code license, but New England Telephone was not so myopic! If you live in the Worcester, Massachusetts, calling area, you can dial **Phone-A-Friend**. This is an experimental service in this exchange which lets you dial a number and be connected with up to five other callers. At random. Sound familiar? There are separate numbers for "juvenile" and "adult" conversations. Sort of like the difference between 2m and 160m. And who knows? If this experiment is successful, AT&T may expand it to cover the entire country—and we'll finally get our no-code ticket.

Another Celeb

JOINING THE GROWING LIST of ham celebrities is Italian President **Franscesco Giuseppi Cossigna I0FGC**. Other dignitaries include Barry Goldwater K7UGA, Indian Prime Minister Rajiv Ghandi VU2RG, and Jordan's King Hussein JY1. Wouldn't it be great to get all of these folks together in one place? I would *love* to see the Prime Minister with an HT on his belt and a Dayton Hat-tenna on his head.

My callsign, eh?

MANY CANADIAN AMATEURS have been asked by the Department of Communications to give up their Q-signal suffixes. While the letters received by stations such as VE7QST are requests, not orders, the DOC has stated that they will no longer issue calls with Q-signal suffixes.

Tick Tock

THE CANADIAN DOC is also moving right along with their plan to restructure the Canadian Amateur Service. According to a report in the *CRRL News*, the majority of VE hams think that the proposal is a good one and do not see the no-code license as a detriment to the hobby. Briefly, the proposed structure is this: Three amateur certificates (licenses) will be available. Certificate A will have no Morse proficiency test. Holders will be given all modes on frequencies above 30 MHz, with a power output no greater than 250 Watts. Also, Certificate A licensees must use only commercially-built transmitters. Passing a 12-wpm Morse test will upgrade Certificate A to Certificate B, which adds all modes on frequencies below 30 MHz. A written examination on advanced electronic theory is required for Certificate C, which allows the holder to use homebrew equipment, transmit with up to 1,000 Watts output, and become a license holder for repeater and remote stations.

Where Am I?

THE TOP SECTION of our Top Band is no longer exclusively an amateur allocation. In order to provide additional spectrum for radiolocation systems that may be displaced by an expanded AM broadcast band, the FCC has given those systems primary status on the band from 1900 to 2000 kHz. Amateur stations may use this segment on a non-interference, shared basis and cannot expect protection from radiolocation signals. It's not as bad as it sounds, though, since the locators will be using spread-spectrum techniques: We may not even know they are there. Also, the FCC is not accepting applications for the new allocation until July of 1987.

Form Format

DON'T USE any FCC Form 610s issued prior to June, 1984, to apply for an amateur-radio license. If you do, the Commission will simply return your applications with a request to use the proper form. You can get copies of the new paperwork from your regional VEC, your nearest FCC Field Office, or the FCC Consumer Assistance Branch, Private Radio Bureau, Gettysburg PA 17325.

Bugged Beads

THE LAST THING a guy wants to worry about is his beads, right? Well, start worrying! **CCS Communication Control, Inc.**, recently discovered worry beads which contain an ultra-miniature radio transmitter. In the Middle East, worry beads are ubiquitous—they are carried to business meetings, while traveling or dining, and so on. CCS was called into action by a gentleman whose business dealings were somehow being leaked to his competitors. What the company found was two sets of beads with a tiny transmitter and a battery built into the largest bead; the transmitter had a range of about one kilometer.

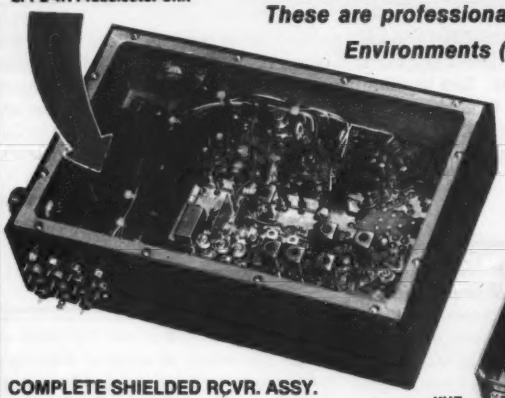
QRV

DON'T FORGET to send in your news items and photographs! Mail them to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: QRX.

Spectrum Repeater/Link Boards & Sub-Assemblies

New FL-4 UHF Helical Resonators Installed in Rcvr., or FL-4H Preselector Unit

These are professional "Commercial Grade" Units—Designed for Extreme Environments (–30 to 60° C.) All Equipment Assembled & Tested.



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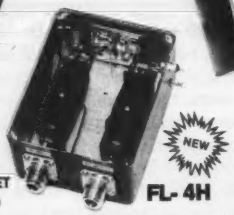

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SCT110 VHF Xmtr/Exciter Board

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- Infinite VSWR proof
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- Designed specifically for continuous rptr service. Very low in "white noise."
- Spurious—.75 dB. Harmonics—60 dB
- With .0005% xtal.
- **BA-30 30 Wt. Amp board & Heat Sink,** 3 sec. L.P. filter & rel. pwr. sensor.
- **BA75 75 Wt. unit also available.**

SCT110 Transmitter Assembly

- *SCT110 mounted in shielded housing*
- Same as used on SCR 1000 & 2000X
- Completely assmbld. w/F.T. caps, SO239 conn.
- 10, 30, or 75 Wt. unit.

SCT 410B UHF Transmitter Bd. or Assy.

- Similar to SCT110, 10 Wts. nom.
- ***Now includes "on board" proportional Xtal Osc./Oven circuitry for very high stability!***
- **BA-40 40W. UHF AMP. BD. & HEAT SINK**

COMPLETE SHIELDED RCVR. ASSY.

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- ***Totally Advanced Design!***
- 8 Pole Front End Fltr. + wide dynamic range—reduces overload, spurious Resp. & Intermod.
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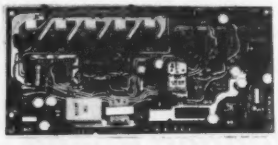
- 'S Meter', Discriminator & Deviation Mtr. Outputs!
- Exc. audio quality! Fast squelch! w/0.0005% Crystal. *("Super Sharp" IF Fltr. also avail.)*

Complete Receiver Assemblies

- Rcvr. Bd. mounted in shielded housing.
- Completely asmbld & tested, w/F.T. caps, SO239 conn.
- As used in the SCR 1000/2000X. Ready to drop into your system!
- **UHF Rcvr. Assy. Now Available w/Super Sharp FL-4 Helical Resonators. Greatly reduces IM & "out of band" interference!**



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- 0/1 inhibit bd. also available
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- **Provides tremendous rejection of "out-of-band" signals w/ out the usual loss!** Can often be used instead of large expensive cavity filters.
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SCR 500 VHF/UHF LINK/CONTROL RCVR.

- SCR200A or SCR450A rack mounted
- Available with or without meters and power supply

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ID250A CW ID & Audio Mixer Board

- Improved! Now includes "audio mute" circuit and "Emergency Power" ID option.
- 4 input AF Mixer & Local Mic. amp.
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- Many other features. Factory programmed.

CTC100 Rptr. COR Timer/Control Bd.

- Complete solid state control for rptr. COR, "Hang" Timer, "Time-Out" Timer, TX Shutdown/Reset, etc.
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Repeater Tone & Control Bds.

For SCR1000/4000 & CTC100/ID250 only

- **TMR-1 "Kerchunker Killer" or "Time Out Warning Tone" Bd.**
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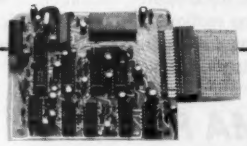
- **PSM-1 Power Supply Mod Kit replaces Darlington pass transistor in older SCR1000/4000s.**

Call or Write for Data Sheets

NEW



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- Uses new high quality Xtal Controlled Decoder IC, w/high immunity to falsing
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Dick W. Rollema PAØSE
v.d. Marckstraat 5
2352 RA Leiderdorp
Netherlands

Japan's Hush-Hush Rushbox

These units were ordered destroyed after WWII, but a few fell into the hands of collectors. Now, after 40 years, PAØSE analyzes the Imperial Army's secret radio.

Communication equipment used by the Allied forces during WWII has become well-known among amateurs, no doubt because enormous amounts have been sold by war-surplus shops for decades after the war ended. Quite different is the situation for German war-surplus material, even here in Europe near to the source of it. The explanation is that the Allied commanders were ordered to destroy all German war equipment that was found after the surrender in May, 1945. Some communication equipment escaped demolition, however, and now rests in museums and with collectors all over the world.

Whether a similar order was issued for Japanese wartime equipment is unknown to me, but the fact is that very few of those items found their way to collectors. This is true in Europe, at least, but I think the situation is not much different in the States. So it was with considerable joy that I accepted a very special birthday present from an old radio friend, Ber van Dongeren PAØDON: the Japanese portable transmitter-receiver pictured in Photo A.

The radio carries a wiring diagram on the inside of the lid (Photo B), but how it was used remained obscure until additional information was provided by Akira Kobayashi JA1JIX. The type number of the radio is 94-6. It was meant for use by the infantry, but found a variety of applications due to its simple operation. Communication distance is given as 2 kilometers.

Frequency is continuously variable in three subbands between 25 and 45.5 MHz. Power during transmission came from a hand-cranked generator, providing 3 volts at 0.35 Amps and 135 volts at 30 milliamps. On receive, power came from batteries for 3 and 135 volts. The antenna was an L-type: 1.4m horizontal and 0.65m vertical.

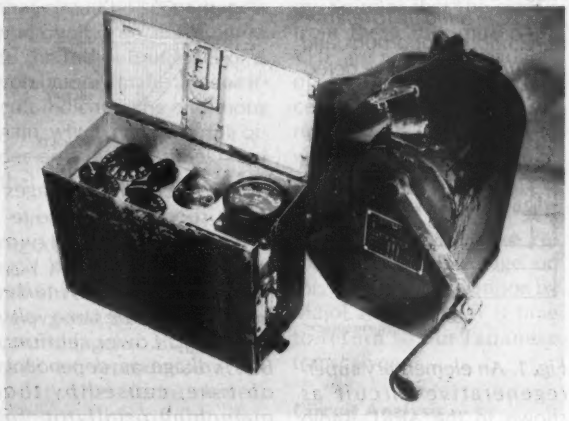


Photo A. Japanese WWII transceiver with hand-cranked generator used when transmitting.

Someone who can read Japanese characters told me that the engraving on the lid says the radio was manufactured by Takanashi in June, 1940. In red characters it says "Secret."

As compared to the sophistication of the modern Japanese sets that dominate the market, the model 94 radio is simplicity itself. There is only one tube, a double triode. The circuit is one that was very popular with amateurs for 56-MHz work in the early thirties. Indeed, the circuit could have been taken straight from *QST* or an *ARRL Handbook* of that period. As a receiver, one triode is a superregenerative detector and the other an audio amplifier. On transmission the first triode becomes a self-excited one-stage transmitter, anode-

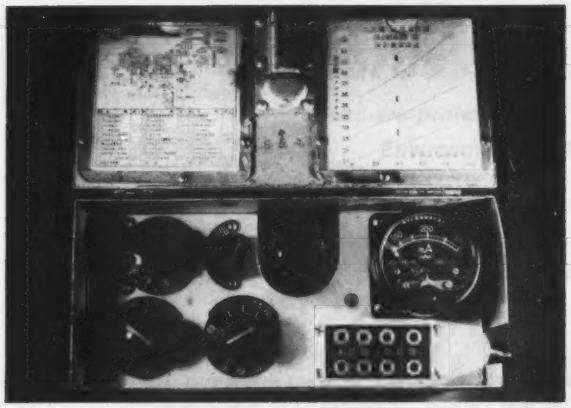


Photo B. Top view of the radio. Inside the lid are the circuit diagram and frequency calibration curves for the three ranges. On the radio, top row left to right: tuning capacitor C5 (see Fig. 4), frequency range switch S1, top of the tube, and antenna-current meter. Bottom: filament-current control R2, variable grid leak R1, and jacks for two handsets.

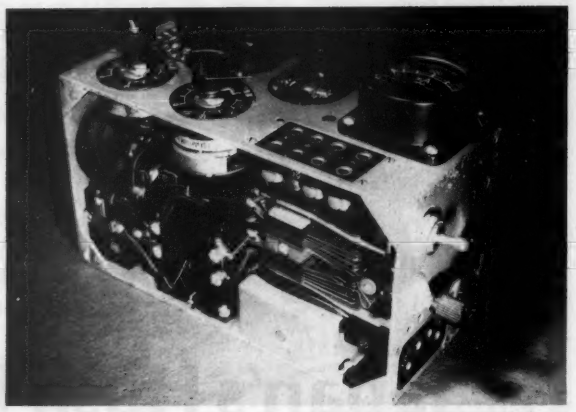


Photo C. At the right center, transmit/receive switch S2; above it, switch S3 to interrupt the microphone circuit when using telegraphy. Behind S2, the Morse "key" can be seen. At the bottom, the cable to the generator is plugged in. Inside the radio, transformer T1 is fastened to the bottom. Microphone transformer T2 is in a screened box below S2. The two round coils below filament-control R3 are L4 and L5, the tuning coils for the quenching oscillation.

modulated by the second triode.

Older readers no doubt will remember the superregenerative receiver or "rushbox." But to the younger generation this electronic marvel may be new. So we start with an explanation of this remarkable type of receiver, invented by that American genius Major E. H. Armstrong, who presented the system in 1922. (Armstrong also gave the world the superheterodyne receiver and the system of frequency modulation for VHF broadcasting!)

The Rushbox Explained

As mentioned, the superregenerative receiver was very popular for reception on VHF and UHF in the early thirties. To explain the principle, I therefore quote the *ARRL Radio Amateur's Handbook* of 1936. Fig. 1 was taken from that source.

First, a "normal" triode with a grid detection and regeneration (positive rf feedback) is explained. The *Handbook* then carries on as follows:

"The limit to which regenerative amplification can be carried is the point at which the tube starts to oscillate, because when oscillations commence, further regenerative amplification ceases. To overcome this limitation and give still greater amplification, the superregenerative *circuit has been devised. Essentially, the superregenerative detector is similar to the ordinary regenerative type but with a low, but super-audible (above audibility) signal introduced in such a way as to vary the detector's operating point at a uniform rate. As a consequence of the introduction of this* quench *or* interruption frequency *the detector can oscillate at the signal frequency only when the operating point is in a region suitable for the production of oscillations. Because the oscillations are constantly being interrupted, the signal can build up to relative tremendous proportions, and the superregenerative detector therefore is extremely sensitive. An elementary form of a superregenerative circuit is shown in [the illustration]. Superregeneration is relatively difficult to attain at ordinary frequencies, and does not possess the property of discriminating between signals of different frequencies characteristic of other types of detectors — in other words, the selectivity is poor. For this reason the superregenerative circuit finds its chief field in the reception of ultra-high-frequency signals, for which purpose it has proved to be eminently successful."*

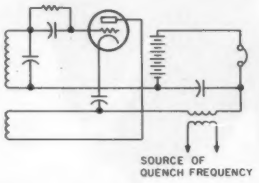


Fig. 1. An elementary superregenerative circuit as shown in the ARRL Radio Amateur's Handbook *of 1936.*

We can go a bit further into the theory by looking at Fig. 2. Here is shown how the signal in the tuned circuit grows exponentially from a starting voltage (V_{in}) to a maximum voltage (V_{max}). V_{max} depends on the anode voltage and maximum anode current the circuit allows to flow. When the voltage in the tuned circuit is higher at the moment the quenching signal makes the detector oscillate, the V_{max} level is reached sooner, as shown in Fig. 2 for a starting

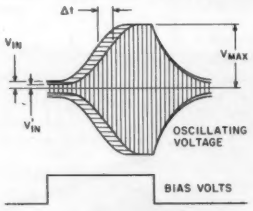


Fig. 2. Oscillating voltages in the superregenerative receiver ensuing from two starting levels, V_{in} and V'_{in} respectively, and finally building up to the same voltage, V_{max}. Lower section: Bias voltage as dependent on time, caused by the quenching oscillator. In reality the voltage is not rectangular but sinusoidal.

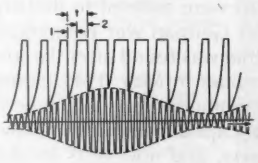


Fig. 3. Received signal, an amplitude-modulated carrier, and the variation of the rectified current through the tube. Starting from the amplitude of the recieved signal, the signal builds up during interval 1 and stays at the maximum level during interval 2. The sum of intervals 1 and 2 is t, the period of the quenching signal.

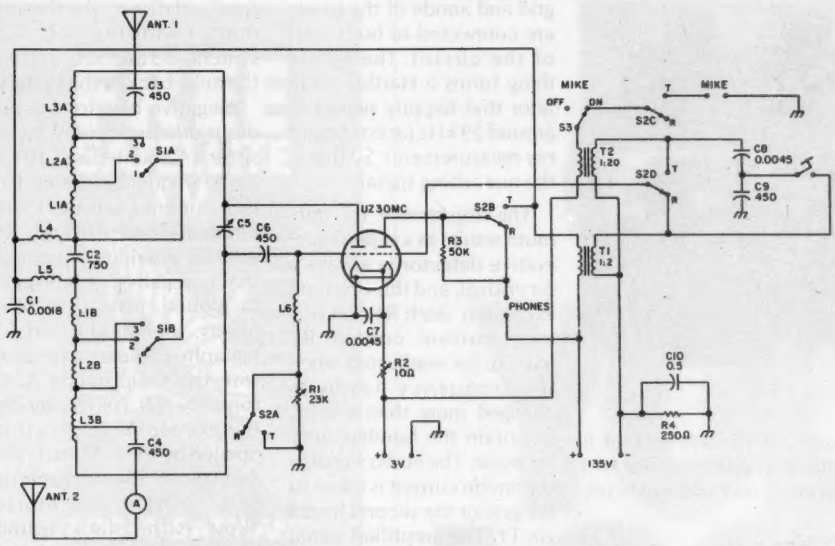


Fig. 4. Circuit diagram of radio type 94-6. The transmit/receive switching is somewhat simplified.

voltage of V'_{in}. The moment the signal decays is also governed by the quenching signal, but independent of the starting signal. So the total surface that is hatched in the illustration varies with the magnitude of the voltage on the tuned circuit at the beginning of each quenching cycle.

As the rf signal is rectified in the detector valve, the hatched area is also a measure for the anode current. This principle is further worked out in Fig. 3, which depicts an amplitude-modulated grid of the detector. The part of the quenching cycle during which oscillations build up has the duration t. So with intervals of t seconds, the anode current builds up as shown in the upper part of Fig. 3.

The buildup follows an exponential law. (For simplicity, the decay is shown as instantaneous at the end of each interval.) So t is divided into a period "1" during which the signal increases and an interval "2" in which it stays constant. It is shown clearly that the area which is a measure for the anode current follows the modulation envelope of the received signal. So in the anode currrent of the superregenerative detector we find the audio that was transmitted. When there is no signal voltage in the tuned circuit there still is thermal noise, which is amplified in the same way as a signal voltage.

This explains the hissing noise that is so characteristic of the superregenerative receiver—lovingly called a rushbox by amateurs of the thirties. As soon as a received signal overrides the noise sufficiently, the hissing sound disappears. In that respect, tuning a rushbox is very similar to tuning a modern FM receiver with the squelch turned off. The fact that circuit noise, perhaps a microvolt or so, is amplified to the full output level of a volt or more in the anode circuit indicates the enormous gain, which can be of the order of a million times. And that in a single stage!

In this respect, the superregenerative receiver is a real marvel, but there is more. The receiver features very good automatic gain control (agc) so that all stations are reproduced at almost the same level. Suppression of impulse noise is excellent, too. This is a very desirable feature on VHF, where automobile ignition noise can be very troublesome. Nowadays every car has good suppression, but before WWII this was more the exception than the rule.

So it seems that the rushbox has only desirable features. Are there no disadvantages then? Sure—selectivity is very poor, as already indicated by the *Handbook*. But even this might be called an advantage: The superregenerative receiver often was used in conjunction with very simple, self-excited, single-stage transmitters. These have very poor frequency stability. So poor that the signals from these transmitters on VHF are mostly unreadable on a superheterodyne receiver. No problem for the rushbox! Its passband is so wide that these signals, which swing all over the place, are coped with easily.

Now that we have refreshed our knowledge on this remarkable invention by Major Armstrong, it is time to return to our Japanese transceiver.

Circuit Analysis

The circuit diagram on the inside of the lid faded so much over the years that I was unsuccessful in making a satisfactory photographic reproduction, so the circuit was redrawn for Fig. 4. (For the sake of clarity, the transmit/receive switching is somewhat simplified.) This switch is visible in Photos A and C.

It is a classic telephone keyswitch with three positions. In the middle position, the set is turned off. The lower position activates the receiver and the upper position activates the transmitter. If both the hand generator and batteries are connected, the transmit/receive switch automatically selects the batteries for reception and the generator for transmission. (These features are deleted in Fig. 4.) S2 is the T/R switch with only two positions shown, T for transmit and R for receive.

The radio is tuned by coils L1, L2, L3, and variable capacitor C5. The frequency range is 25–45.5 MHz, and this is divided into three subbands selected by S1. On the lowest range, all three coils are used; on the middle band, L1 is short-circuited, and on the highest band, both L1 and L2 are short-circuited so that only L3 remains. The coils are three separate ones on formers that can be seen in Photo D. Each coil is divided into equal halves, A and B. Two antennas can be used, indicated as ANT.1 and ANT.2. Perhaps one was meant as an antenna and the other as a counterpoise? A thermocouple ammeter indicates current in ANT.2.

Let us now look at the circuit when the radio is used as a superregenerative receiver. S2 is in position R. The left triode is the detector. C6 is the grid capacitor and R1 is the variable grid leak. But where is the quenching signal coming from? From the same triode, playing a double role. It oscillates at the receive frequency and the quenching frequency at the same time!

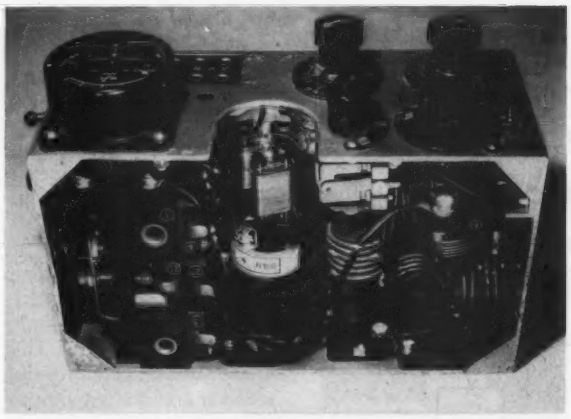


Photo D. At the right, tuning capacitor C5, and around it coils L1, L2, and L3. Left of the tube, the connectors for two antennas (or antenna and counterpoise), and at the extreme left, the Morse key.

The Japanese designers surely used a clever trick here.

I did not explain why coils L1, L2, and L3 were split into halves. The reason will become clear now. The A and B parts of the coils are connected via C2, which has a very low reactance at rf, so that for the receive frequency the coils can be considered as directly connected. L4 and L5 are closely coupled, as can be seen in Photo C, top left. They act as one coil with a center tap.

C2, L4, and L5 form a tuned circuit. As the center tap is grounded via C1, and grid and anode of the triode are connected to both ends of the circuit, the whole thing forms a Hartley oscillator that happily swings at around 29 kHz (according to my measurement). So that is the quenching signal.

The adjustment for optimum results as a superregenerative detector is always a bit critical, and this one is no exception. Both R1 and filament-current control R2 have to be readjusted when the frequency has been changed more than a little, to obtain the familiar rushing noise. The audio signal in the anode current is taken to the grid of the second triode via T1. The amplified signal goes to the phones. Two of these can be connected to the radio, and they are in the form of handsets that also carry the microphone.

Now we switch to transmit by moving S2 to position T. The left triode becomes a self-excited transmitter, anode-modulated by the triode at the right. S2A short-circuits grid leak R1. So the transmitter tube operates without bias. This is rather unusual, but some reflection brought me the probable explanation. The quench signal has to be stopped on transmission without interrupting the rf oscillation. This is surely effected by short-circuiting R1. Choke L6 has a very low reactance, almost zero Ohms, for the relatively low quench frequency of 29 kHz—so oscillation is impossible. For the transmit frequency, L6 has a high reactance and does not prevent rf oscillation.

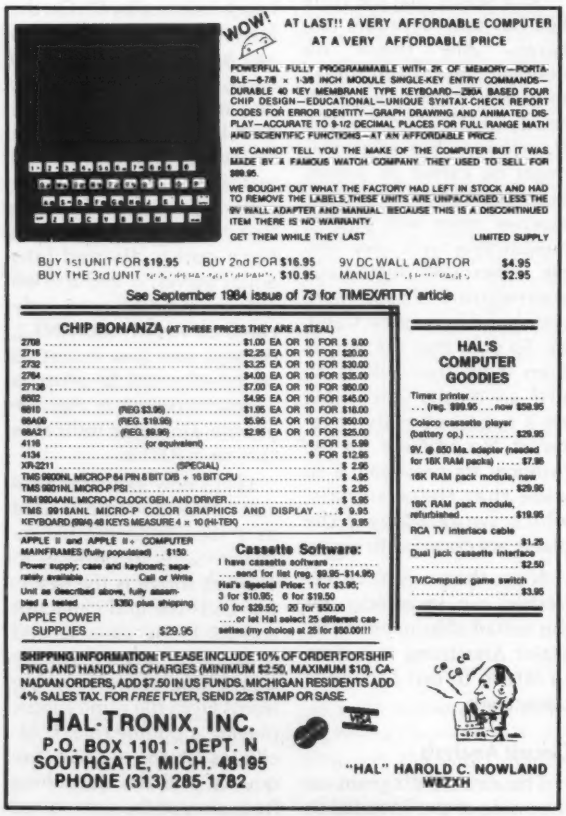
The primary winding of T1 now becomes the modulating choke; through it flows the anode current of both triodes (Heising modulation). R3 feeds a bit of signal to the phones for sidetone. Switch section S2D connects the grid of the right triode to microphone transformer T2. The microphone is of the carbon type that requires a dc current. This comes from the 3-V battery and flows via the primary winding of T2, switches S3 and S2C, and via the mike back to the battery.

Negative bias for the audio triode is provided by resistor R4, shunted by C10 for audio frequency signals. Return current from the 135-V battery flows through R4 and so provides a voltage that is negative with respect to ground. Instead of telephony, tone-modulated telegraphy could also be used with the radio (mode A2A, formerly A2). For this mode, the microphone circuit is opened by S3 (in Photo C visible above the transmit/receive switch). The Morse "key" is the black, round knob to the right of the transmit/receive switch in that photo. When the key is worked, the key contact connects the secondary of T1 to C8 and C9, as shown in Fig. 4. This causes af feedback and the right triode generates an audio-frequency note that modulates the transmitter.

Mechanical Construction

The radio is built like the proverbial battleship. As the pictures show, every component is bolted to the frame. Each part carries a number that is also used in the circuit diagram and the parts list on the inside of the lid. Obviously, the designers had servicing very much in mind.

The radio slides into a metal box. How this was carried is not clear, but most likely it was in a canvas cover with the necessary straps for slinging it over the shoulder or fastening to the soldier's belt. As Photo A shows, the generator has a canvas strap. Not shown are pairs of metal hooks that slide outwards at the bottom of the generator. These obviously are meant for hooking the machine to the belt—one pair for the right-handed soldier, the other for the left-handed one. Cranking the generator is not an easy job—so transmissions will be kept brief! ■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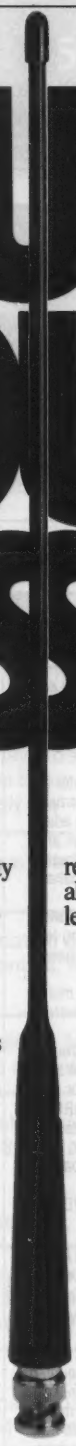

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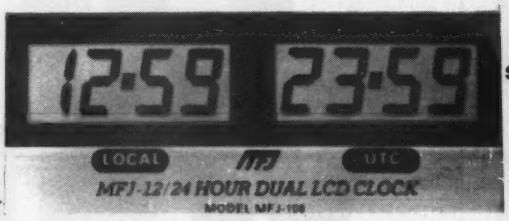

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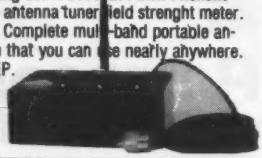

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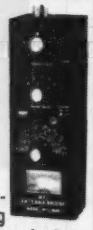

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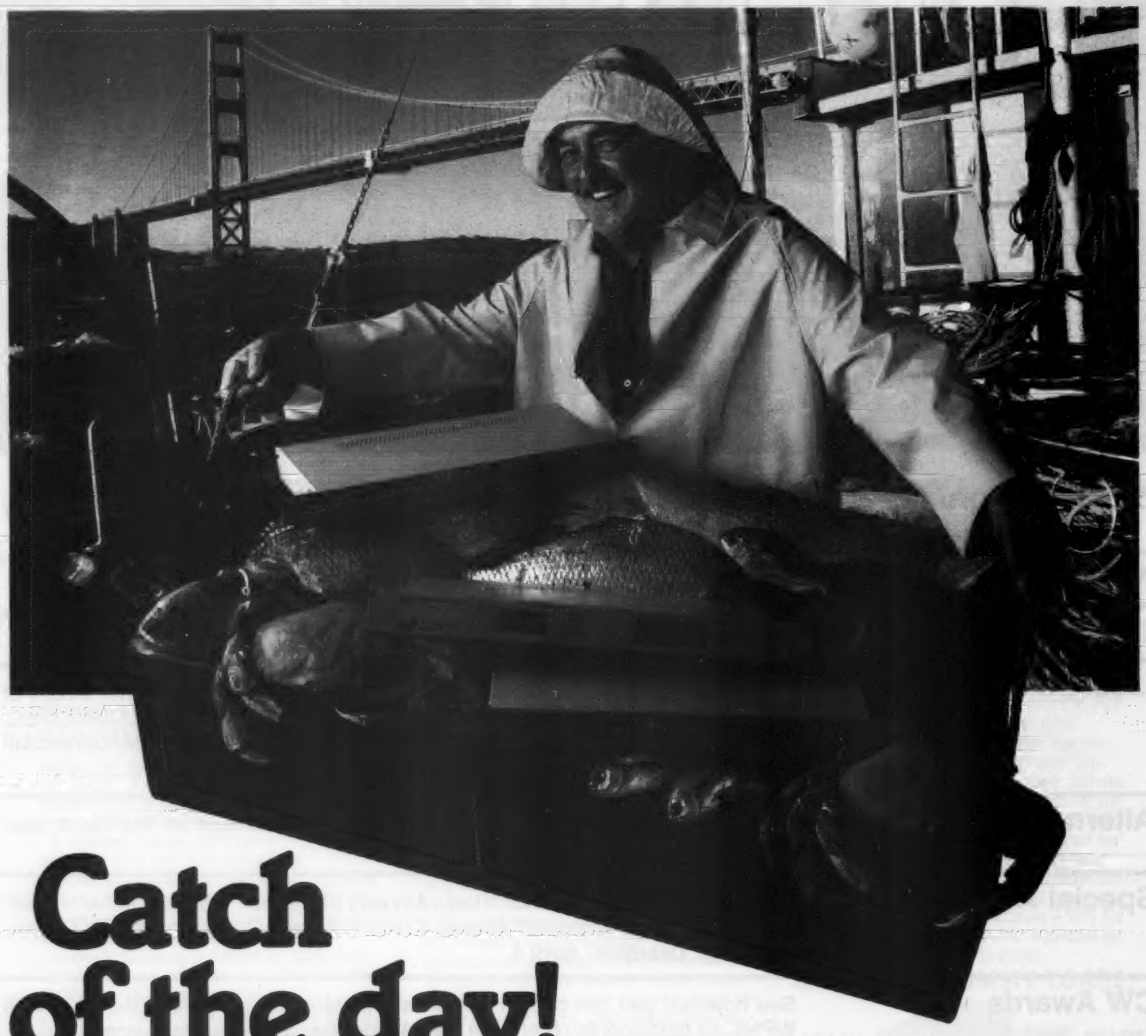

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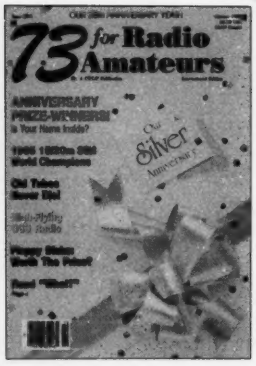

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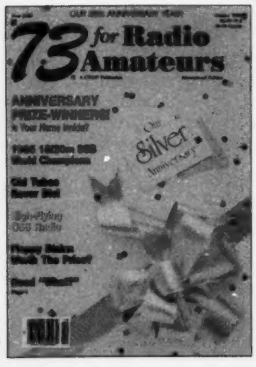

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Believe it or not, everybody does not use solid-state, twelve-volt-compatible equipment even in these modern times. I have an old surplus ARB receiver that I use to listen to the shortwave bands. I especially enjoy *The World Service* of the BBC. The receiver has vacuum tubes, and I know several other SWLs/hams who still use vacuum-tube receivers for similar entertainment. Recently, I got bitten by the RTTY bug and began looking at TU (terminal unit) designs.

The first thing I did was to look at the audio output from the receiver to determine such things as noise level, signal levels, and so on. My biggest surprise was the hum level; it was almost as large as the audio signals. Apparently, my poor low-frequency hearing response and the poor low-frequency response of the four-inch speaker combined to reduce the hum to an acceptable level. A couple of other tube-type receivers were checked. The hum level ranged from my high to about one-tenth the normal audio level.

Once we were all aware of the problem, the hum became unbearable—ignorance is bliss! Fine, all you need to do is increase the high-voltage filter capacitors. This was considered easy until after I had clipped in 200 microfarads to get the hum down to a reasonable level. There had to be a better way. The solution was to build an electronic hum eliminator.

The hum eliminator works like a poor man's voltage regulator. A normal series pass regulator, as in Fig. 1(a), consists of a series pass transistor and a reference voltage. The transistor operates as an emitter follower and the output voltage is simply the reference voltage minus one base-to-emitter voltage drop. The hum eliminator replaces the reference voltage with a resistive voltage divider and a filter capacitor; see Fig. 1(b).

The output voltage is now equal to the input voltage times R2/(R1 + R2). The base-to-emitter drop is ignored. So what good is it? The answer lies in the addition of the capacitor. Without the capacitor, the output voltage would follow the input voltage and the percent of ripple present would not be changed. The capacitor removes the ripple from the base voltage and thereby from the output.

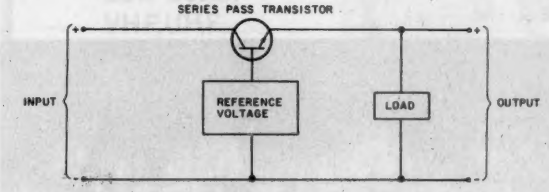


Fig. 1(a). Simplified series voltage regulator.

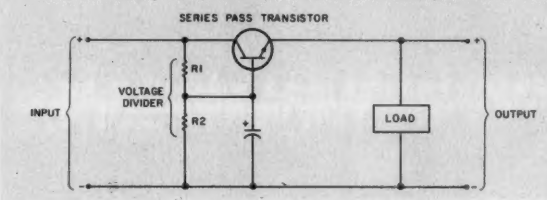


Fig. 1(b). Simplified hum-eliminator circuit.

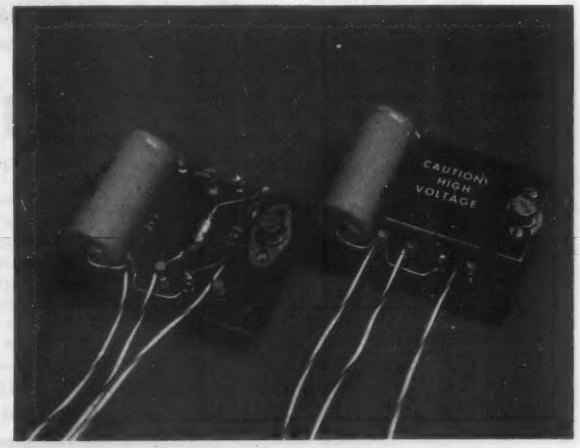
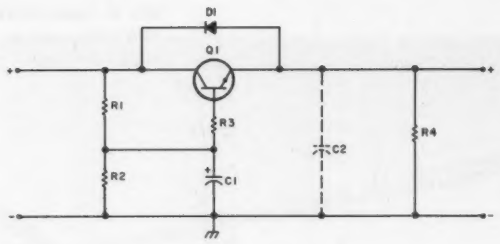


Photo A. The electronic hum eliminator.



SYMBOL	VALUE	FUNCTION
R1	13K, 1W	VOLTAGE DIVIDER
R2	100K, 1W	VOLTAGE DIVIDER
R3	270Ω, 1/2W	PARASITIC SUPPRESSOR
R4	120K, 1W	BLEEDER
C1	20μF, 450W.V.	FILTER
D1	600V, 1A IN3191	REVERSE VOLTAGE PROTECTION
Q1	SEE TEXT	SERIES PASS TRANSISTOR
C2	.01, 600V	BYPASS (OPTIONAL, SEE TEXT)

Fig. 2. Schematic of the hum eliminator.

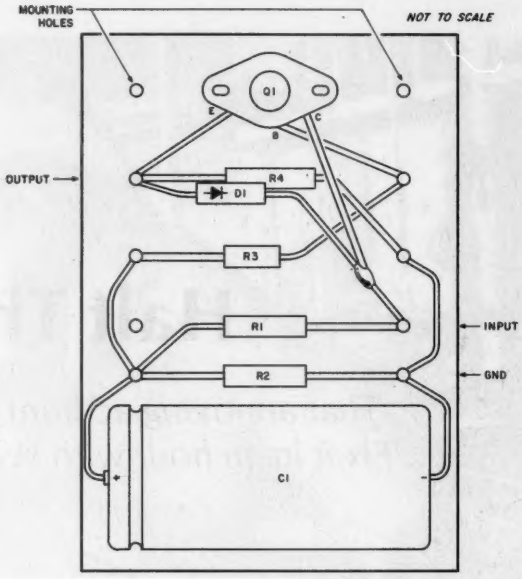


Fig. 3. Pictorial layout of the hum eliminator.

The success of this circuit relies on the difference in time constants in the power supply and the hum-eliminator base circuit. The receiver power supply has a dynamic impedance of about 400 Ohms. The impedance seen at the base of the transistor is roughly R1 in parallel with R2. If we make the parallel combination of R1 and R2 about 10,000 Ohms, the base filter capacitor is 25 times more effective than the same capacitor placed across the input.

Not bad, huh? But this is not free. The output voltage is less with the hum eliminator due to the division ratio of R1 and R2. R1 and R2 should be chosen so that the final output level is less than the input voltage minus the ripple. Otherwise, the series pass transistor will be reverse biased and possibly destroyed.

The actual circuit used is shown in Fig. 2. Note that it is slightly more complicated than that shown in Fig. 1(b). First, a diode has been added across the series pass transistor to prevent reverse biasing. Second, a 270-Ohm resistor has been added to the transistor base circuit. The resistor eliminates parasitic oscillations from the otherwise common base amplifier formed by the addition of the filter capacitor. R1 and R2 were chosen to produce a 25–27-volt drop across the transistor. Since the input ripple was only 10 volts under load, the drop is sufficient. The output ripple is now less than .05 volts and the hum on the audio output is not discernible on my scope or with my ears.

The output transistor should be rated for at least one and a half times the no-load input voltage. Also, the transistor must dissipate the peak current through it times the peak voltage across it. For my receiver, this works out to be 27 volts times 60 milliamps, or 1.62 Watts. I used a 2N4063 because it was available and mounted it on a small heat sink.

C2 is optional and was not needed for every unit. It prevents oscillation when the output leads are excessively long. It is cheap, and eventually I added one to each of my units.

The units were constructed on small terminal boards with staked terminals. Fig. 3 is a pictorial layout of the circuit before C2 was added. Photo A shows two units, one with the heat sink installed and one with the

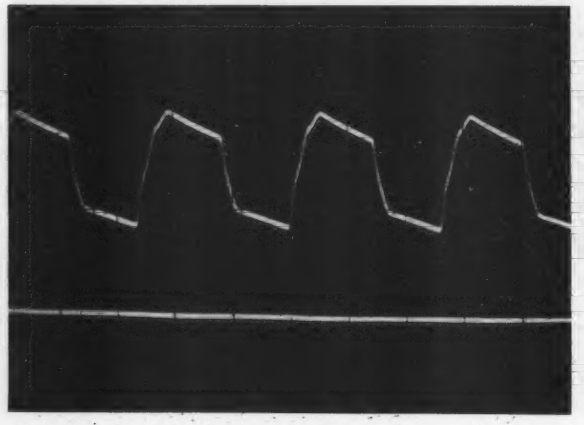


Photo B. Ripple reduction.

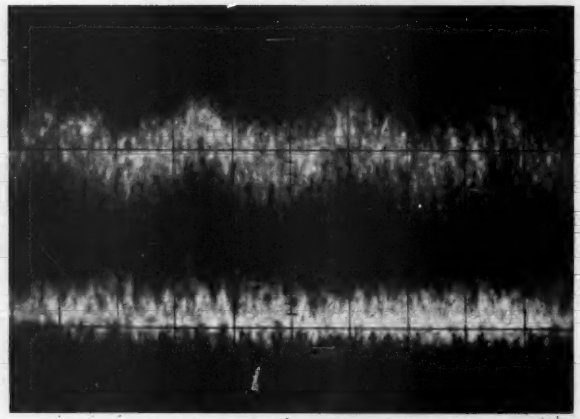


Photo C. Hum reduction, high volume.

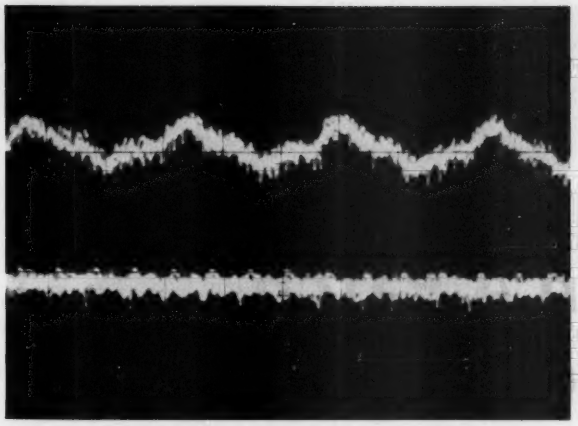


Photo D. Hum reduction, low volume.

heat sink removed to provide a better view. The scope waveform photos show the improvement with this circuit. Photo B shows the ripple reduction. The upper trace, 5 V per cm, was the original ripple level. The lower trace, also 5 V per cm, is the present ripple level. Photos C and D show the hum reduction on the audio output for high and low volume outputs. In each photograph, the upper trace is the before case and the lower trace is the present case.

Now I can go back to looking at TU designs, and soon, hopefully, I will be copying RTTY signals as well as enjoying listening to the BBC with a much improved receiver. ■

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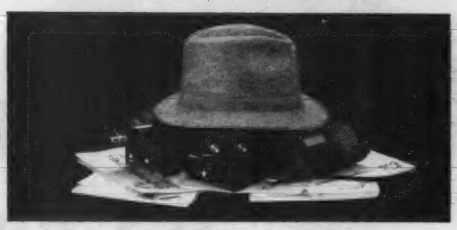

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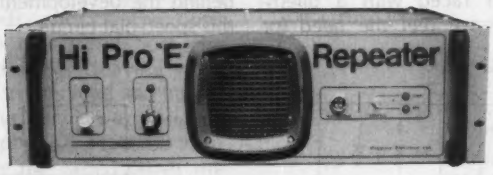

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It's Friday afternoon. You're caught in heavy rush-hour traffic. You're going to be late getting home. It would be nice to punch up the patch and advise your wife to adjust dinner time, but do you dare risk dialing in this traffic? Sure! If your rig is equipped with this speed-dial circuit, your eyes never have to leave the road. This article describes circuitry which allows a telephone number to be dialed at high speed by simply pushing a single button on the microphone.

Most hams that operate FM mobile are sooner or later faced with a dilemma—we feel the need (or urge) to use the autopatch while driving. The need is not urgent enough to pull off the freeway or busy street and park, and trying to manipulate a DTMF pad while driving is certainly not worth the risk. And yet, it really would be nice to make that call. I have found myself in this situation many times. This was the reason behind the development of this speed-dial circuit.

There is another benefit gained from using this speed-dial circuit. When the dial button is pushed, the phone number is transmitted at a rather fast rate. The entire seven-digit sequence takes only about one second. This means that each burst of tones lasts only about 65 to 70 milliseconds (there is a silent space between tones). The shorter the burst length, the lower

Photo A. The speed-dial switch mounts on the side of the microphone near the area where the remote volume control used to be. A protection ring around the dial button eliminates any accidental dialing sequences while handling the microphone.

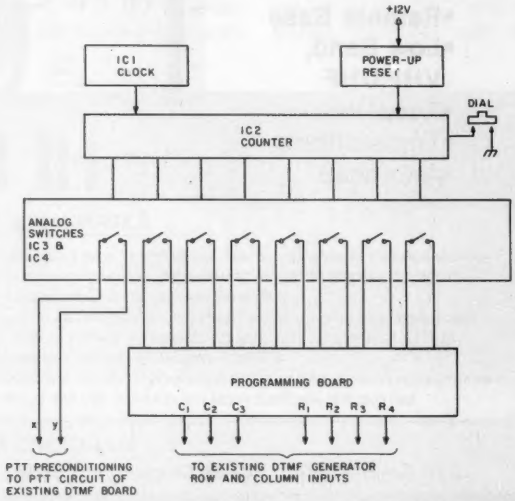

Fig.1. Block diagram of the speed-dial circuit.

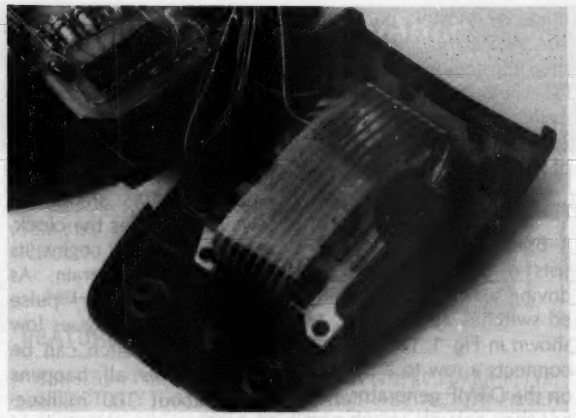

Photo B. In the newer-style microphone (Model PCM-369), capacitor C3 must be changed to a physically smaller tantalum type. Leave its leads long and let it hang over the edge of the board. The older-style PCM-2000 microphone does not need this change.

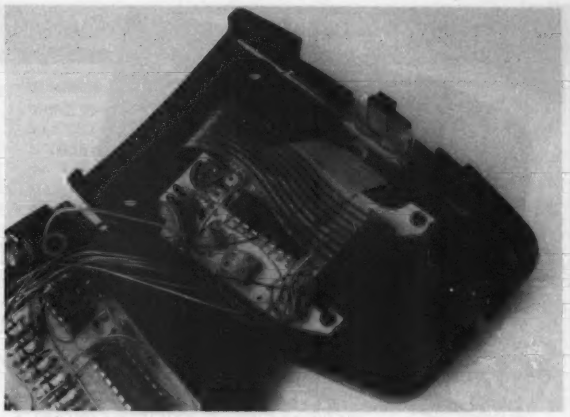

Photo C. In the PCM-369 microphone, the row-and-column leads are connected to the existing solder pins of the plastic bus connector. Route the wires underneath the flat printed-bus cable. Be careful not to burn or melt this printed bus or the connector when soldering in this cramped area.

the probability that rf flutter or "picket-fencing" will cause the telephone equipment to see a double digit. Hence, this speed-dialed number tends to be more accurate than a hand-dialed number lasting hundreds of milliseconds per digit.

Limitations

Unfortunately, in order to fit the parts inside the already-stuffed microphone case, certain sacrifices had to be made. There just wasn't enough room for memory chips and their associated parts, so this dialer can hold only one phone number—presumably your home phone, or one that you call regularly. This number is programmed with tiny wire jumpers and is changeable in about ten minutes with a soldering iron. An advantage of this type of "memory," in addition to saving space, is that it is guaranteed not to forget when powered down!

A preconditioner for the PTT would have been nice—a circuit that brings up the transmitter and gets the squelch open on the repeater receiver before the phone number is dialed. Again, space limitations won out over bells and whistles, and because of that, I recommend that you squeeze the PTT bar just prior to pushing the dial switch. I did design in some PTT preconditioning, using what limited space I had. The circuitry keys the transmitter about 200 milliseconds prior to the actual dial sequence. Sometimes, however, that is still not quite enough time to bring up the transmitter and open the receiver squelch circuits in time to hear the first digit dialed. As a general rule I would recommend that the PTT bar be squeezed first, just to be safe. This is really much easier to do than it sounds, and can be done quite nicely with just one hand while leaving your eyes on the road and traffic.

This circuit was designed and physically tailored to fit inside my Azden DTMF microphone. However, the circuit is electrically compatible with any DTMF encoder using row-and-column inputs. This includes virtually all of the current encoder circuitry on the market today. If you happen to own an Azden microphone, then you're home free, as I have included a full-size printed-circuit-board layout for this project which will fit into either of the Azden microphones supplied with their earlier transceivers.

It is important to point out that although this article is concerned with mounting circuitry inside a microphone, this is only necessary when the DTMF encoder and touch pad are also mounted in the microphone. The speed-dial circuit must be installed where it has access to the row-and-column inputs of the DTMF encoder chip. In cases where the touch pad is panel-mounted on the radio, the speed-dial circuit would be installed inside the transceiver.

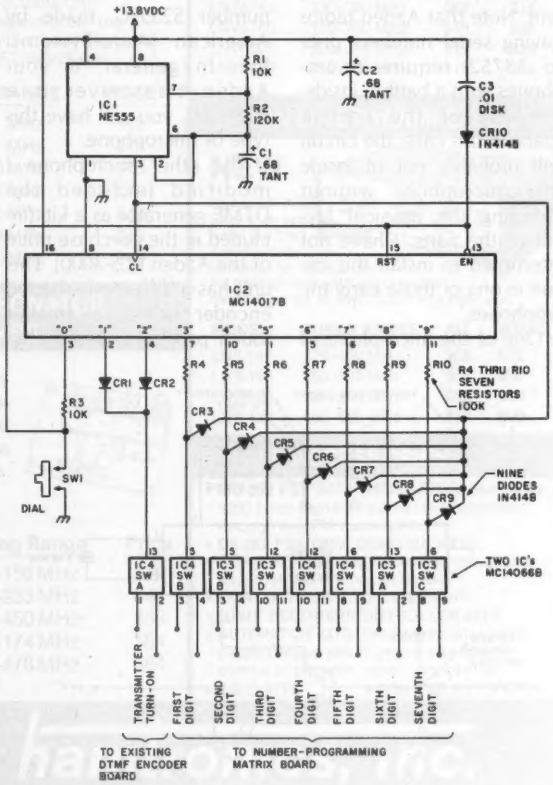

Fig. 2. Schematic of the speed-dial circuit.

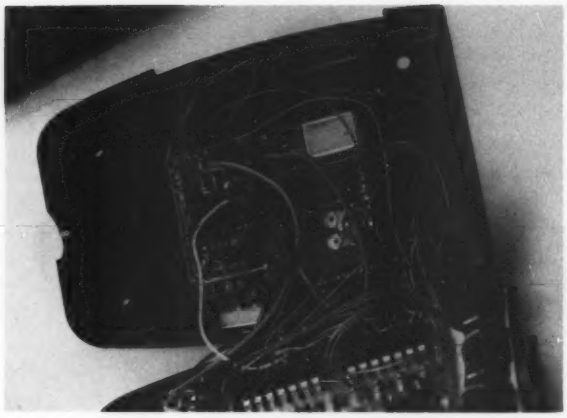

Photo D. In the older-style PCM-2000 microphone, the row-and-column leads are soldered to existing PC pads on the end of the DTMF board. The crystal must be bent up slightly while soldering. Use just a small amount of heat and do not disturb the existing wires which are poking through these pads from below the board.

I have installed this circuit inside two different Azden microphones. One was supplied with the Azden PCS-2000, and the other was supplied with the PCS-3000. These two microphones are physically the same basic unit. Note that Azden radios having serial numbers prior to 53752 require microphones with a battery inside. Because of the limited space in this case, the circuit will probably not fit inside that microphone without changing the physical layout of the parts. I have not attempted to install this circuit in one of those early microphones.

One of the microphones I did modify uses a DTMF encoder, model CSTTK-1, made by Communications Electronics Specialties, Inc. The encoder comes fully assembled in a replacement back for the microphone, and uses a chip, part number S2559C, made by American Micro-Systems, Inc. In general, if your Azden transceiver is a PCS-2000, you will have this type of microphone.

The other microphone I modified included the DTMF generator as a kit (included in the purchase price of the Azden PCS-3000). This unit has a differently-shaped encoder board, a smaller touch pad, and uses a chip made by Mostek, part number MK5087N. The front of this microphone is labeled PCM-369. In general, if your Azden transceiver is a PCS-3000, you will have this type of microphone.

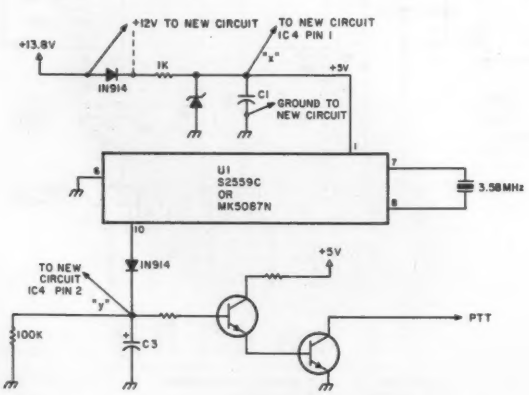

Fig. 3. Partial schematic of the existing DTMF encoder showing points of connection to the new circuit.

Functional Description

Briefly, this circuit consists of a decade counter driving a set of eight isolated switches in sequence, as shown in Fig. 1. Each switch connects a row to a column on the DTMF generator, just as the actual touch-pad switch does when the operator presses it. These switches are normally all off and the counter is in a reset or hold state. When the dial switch is pressed, the counter sweeps through its sequence, turning each switch on, then off. As each switch connects a row to a column input, a pair of tones corresponding to that digit is generated and transmitted just as if the proper switches on the touch pad had been pressed.

Fig. 2 shows the schematic of the speed dialer. IC1 supplies the clock signal for IC2, a 5-stage divide-by-10 Johnson counter with 10 decoded outputs. As IC2 counts, each of its ten outputs goes high sequentially, starting at pin 3 and going on through pin 11, and then back to pin 3. When IC2 is reset (by pin 15), pin 3 is forced high immediately and all other outputs are forced low.

On power-up, C3 and CR10 pass a positive pulse to pin 15, which resets the counter. Pin 3 immediately goes high and is fed back to pin 15 via R3 to hold it in the reset state. This high is also fed to pin 13, which holds the counter disabled from the free-running clock at pin 14. This is the state that the counter remains in until called on to dial a number.

When the dial switch is momentarily pressed, IC2 pins 13 and 15 are pulled low. This enables the clock, and the counter begins its sequential pulse train. As soon as the first clock pulse is registered, pin 3 goes low and the dial switch can be released. This all happens within about 100 milliseconds. Thus the chip is held enabled and counting by its own pin-3 output (low) until it goes through all ten outputs and cycles back around to bring pin 3 high again. At that time, this high disables the counter and locks the chip in its "hold" mode again.

Now let's see what happens as the counter sequentially outputs highs. Each of these outputs is fed in turn to either IC3 or IC4. These chips contain MOSFET bilateral switches. Each one of these switches is like a tiny relay with normally-open switch contacts. When the input goes high, the switch closes. These switches are really very good—opened they have less than 200 picoamperes leakage, and closed resistance is typically less than 80 Ohms.

The first output, pin 2, is fed via CR1 to switch A. This switch is part of the PTT preconditioning mentioned earlier. The output is connected to the existing DTMF board, supplying +5 volts to the base of the PTT driver transistor. This connection is shown as points X and Y in Fig. 3. When the switch closes, it keys up the PTT

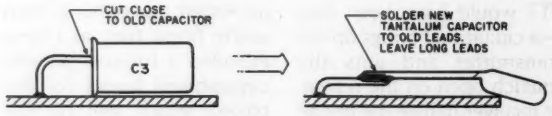

Fig. 4. For the PCM-369 microphone, replace C3 with a smaller tantalum capacitor. Leave long leads and let it hang over the edge of the encoder board.

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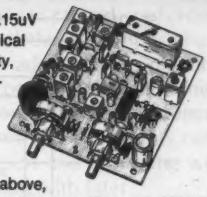

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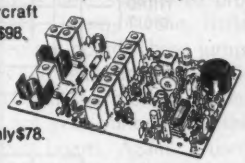

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50–52	28–30
50–54	144–148
144–148	28–30
145–147	28–30
144–144.4	27–27.4
146–148	28–30
144–148	50–54
220–222	28–30
220–224	144–148
222–226	144–148
220–224	50–54
222–224	28–30
432–434	28–30
435–437	28–30
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27-27.4	144-144.4
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50-54	220-224
144-146	50-52
50-54	144-148
144-146	28-30

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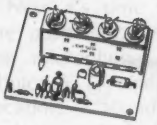

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HRA-220	213-233 MHz	$49
HRA-432	420-450 MHz	$59
HRA-( )	150-174 MHz	$54
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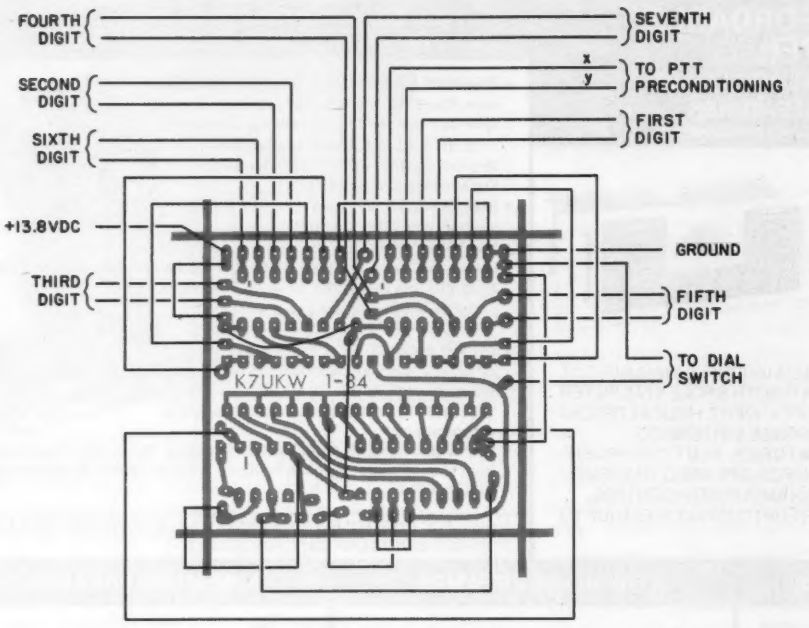

Fig. 5. Layout of the main board, shown from the foil side, detailing jumpers and interconnect wires.

and charges the PTT holding capacitor (C3, Fig. 3), which holds the PTT on until the next high from IC2 pin 4. This high from IC2 pin 4 is also fed to IC4 switch A, via CR2, which keeps the PTT on and again charges the holding capacitor. The net effect of all this is to give the transmitter a 200-millisecond head start before the tones are actually generated. This helps get squelch circuits opened prior to the actual dialing of the number.

The rest of the operation is very straightforward. As each output goes high, its associated switch is closed. This switch is tied across the row-and-column input for that digit. When the switch closes, the tones are generated. After the last digit is generated, the counter rolls around to pin 3 again, where it stops itself and holds, waiting for the next dialing sequence.

Resistors R4 through R10 and CR3 through CR9 form logical AND gates at the input to each of the seven bilateral switches. Here the sequential highs from the counter are ANDed with the free-running clock to produce first a dual tone and then a quiet period for each digit produced. The reason for this is so the telephone equipment can distinguish between two sequential identical digits. For example, in a phone number such as 296-5114, if there were no quiet period between digits, the phone equipment would only see 296-514, with the "1" being twice as long as the other digits. Telephone equipment specifications require certain minimum-timing sequences and inter-digit pauses, and the circuitry operates within these constraints.

Some readers may wonder why I used resistors and diodes to form the AND gates instead of an integrated circuit like the CD4081. Although it would have taken up no more room on the board, the PC layout would have become much more complicated due to the input/output-pin layouts on these chips.

The phone numbers are actually developed on the little programming board, where each bilateral switch closure is jumpered to the proper row-and-column input for that particular digit in the sequence. Fig. 8 shows the board programmed for a sample number.

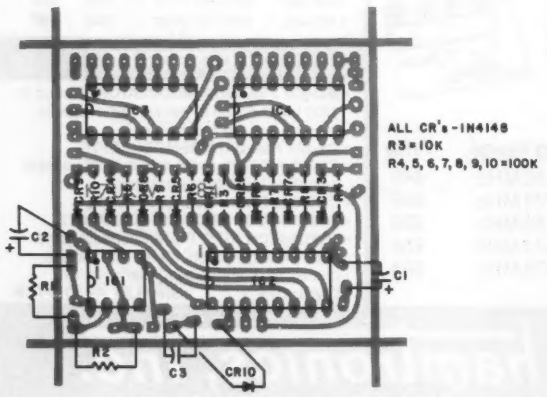

Fig. 6. Parts placement guide as seen through the board.

Mounting Considerations

In order to make this new board fit inside the Azden microphone, a few existing conveniences have to be given up. The remote volume control (and squelch control if your microphone has it) must be removed. I don't think of this as a great inconvenience because I never use them anyway. In fact, I had already traded my remote-squelch control for a reverse switch to allow monitoring of the repeater input momentarily. I kept that switch and removed the red volume knob, wrapped the volume pot in tape, and stuffed it down under the reversing switch where it was out of the way.

On the newer microphone (the one labeled PCM-369) a change must be made to the DTMF generator board. Capacitor C3, the inter-digit PTT hold-timing capacitor, must be changed from a rather fat electrolytic to a slender tantalum type and, at the same time, moved so that it hangs over the edge of the board. See Fig. 4 and Photo B. This gives us nearly an eighth of an inch more room in the cavity between the DTMF encoder board and the microphone element, allowing the new speed-dial board to fit snugly within this space.

Due to obvious space requirements, I recommend using printed-circuit-board techniques. I used a single-sided board layout rather than a double-sided layout for two reasons. Single-sided boards are much easier to make masks for, and most hobbyists shy away from double-sided work because of the extra time and effort needed for proper registration. Since I planned to

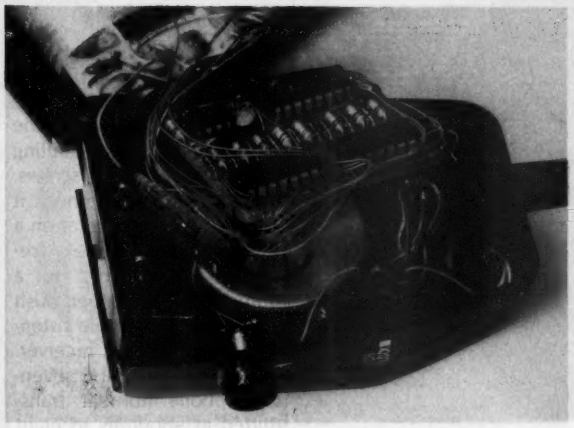

Photo E. Packing it all inside the microphone case looks impossible at first glance. The little program board slips vertically between the mike element and the two up/down switches; cover the solder side with electrical tape first. The main board then overlaps it and lies flat against the mike element, insulated with Kraft paper.

share this with other hams, I opted for the simplest technique from a construction standpoint. In the case of a small circuit like this, being constructed at home using hobby techniques, a single-sided layout using even a large number of jumpers is usually preferred over double-sided layouts.

Constructing the Circuit

When you have etched, cleaned, and drilled your boards, there are a few considerations to keep in mind while you stuff them with parts and connect the jumper wires. Use reasonably small wire for all jumpers and connecting leads. Space inside the microphone is at a premium and the smaller the wire, the easier it will be to get the case halves back together after adding this new circuit. I used AWG 30 Kynar wire-wrap wire for everything. It is very thin and the insulation is tough.

Start by installing all the resistors and diodes in the middle of the main board. Hole spacing is tight, but quarter-Watt resistors will just fit if their leads are bent tightly down against the ends of the resistor body. Pay attention to Fig. 6 and get the diodes in correctly—there are two diodes near the center of the board that are reversed from the others. Next, install all the jumpers on the main board. Fig. 5 shows these jumpers along with the other interconnect wires. Be sure to route these jumpers around the areas where the four ICs will be placed. We want the ICs to fit tightly against the board, not on top of a wire. Note that Figs. 5 and 6 are viewed from the solder side of the board. It was considered easier to locate holes from this side of the board since the top side is not silk-screened.

After soldering the connections, be careful when snipping off the wires on the bottom side of the board. The wire ends must be cut very short and flush to the board. If big blobs of solder and wire are left, the board will be too thick to fit inside the microphone. Be very careful to leave no sharp points either, because these could cause shorts.

Now install all of the other parts except the ICs. Fig. 6 shows their locations. Refer to the photos to bend the three capacitors. Their orientation is not critical, but the parts do have to lie flat against the board to keep the package as thin as possible.

Now it's time to mount the push-button switch on the microphone. Refer to Photos A, E, and F for the location. I found it much easier to attach two eight-inch leads to the switch before I mounted it—the excess can be trimmed off when soldering the wires to the board. Photos A and E show a raised cylinder around the actual push-button. I added this to prevent any possibility of an unintentional dialing sequence. Do not add this yet; its construction and mounting will be dealt with later.

The next step is to program (jumper) the little memory board. These jumpers can be put in last, but it is easier if the memory board is not yet connected to the main board. Again, I used AWG 30 Kynar wire. Refer to Fig. 7 and Table 1 for the placement of the program jumpers. Fig. 8 is an example; it is shown programmed for the phone number 296-1234.

When the memory board is programmed, it must be attached to the main board by the digit-enable wires. These connections are shown in Figs. 5 and 7. When cutting the wires, be sure to leave enough length to position the two boards as shown in the photos. The little telephone-number program board will mount vertically, underneath the end of the main board. The main board just overlaps the little board.

The last connections to this little board are the row-and-column inputs from the existing DTMF board. Refer to Fig. 9 if you have the older-style microphone (Azden PCM-2000). Refer to Fig. 10 if you have the newer-style microphone (Azden PCM-369). Fig. 7 shows the connections to the program board. These leads should be left long enough to allow the case halves to open flat for servicing, but not any

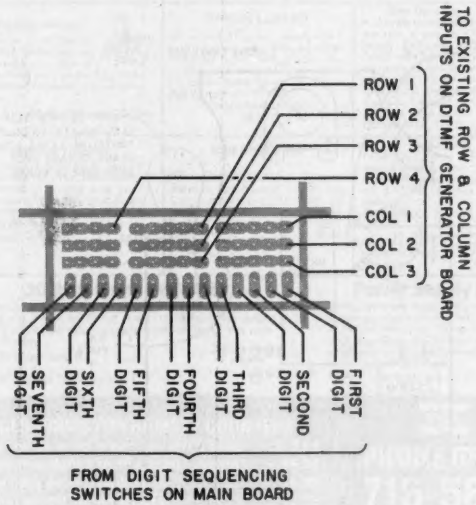

Fig. 7. Solder side of the program board, showing interconnect routing.

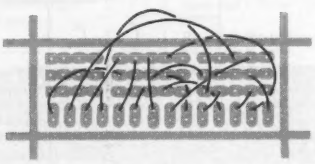

Fig. 8. A programmed memory board. The number is 296-1234.

longer than necessary. It all has to fit inside eventually!

There should now be only six holes left on the main board without wires in them—two for the dial switch, two for +Vcc and ground, and two for the PTT preconditioning circuit. Cut four eight-inch wires. Solder one end of a wire into each of the remaining holes except the dial-switch holes. Refer to Fig. 5. Let the free ends dangle for now.

Cut a piece of electrical tape and cover the solder side of the little memory board. Referring to Photo E, lay the memory board vertically between the microphone element and the up/down switches. The tape-covered solder side should face away from the microphone element. The main board should lie flat against the back of the microphone element, solder side down against the top of the microphone element. You must remove any pieces of sticky-backed foam that were used to keep the microphone element in place.

Fig. 3 shows a portion of the circuit used in the existing DTMF encoder. The circuit is similar for both models of Azden. Fig. 3 indicates electrical connections for the four wires previously mentioned. Depending on your type of microphone, Figs. 9 and 10 show the actual physical connections indicated in Fig. 3. Refer to the correct figure and Photos B, C, and D, and connect these four wires. Refer to Fig. 5 and connect the two wires coming from the dial switch.

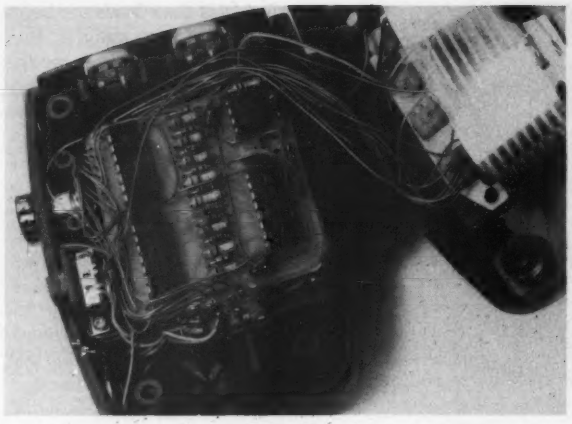

Photo F. When mounting the parts on the printed-circuit board, be sure to orient the three capacitors flat against the board—there is not enough room to allow them to mount vertically. The exact routing of the many connecting wires is not critical.

Refer to Fig. 6 and install the integrated circuits. Be careful not to handle their leads any more than necessary—use standard CMOS precautions. After soldering them in place, be sure to snip off all the sharp tips. Now cut out two pieces of heavy paper (I used index-card stock) just the same size as the main board. Slip one piece under the main board to protect the solder side from touching the microphone element. The other piece goes on top of the main board to protect its parts from touching the existing DTMF board. It might be a good idea to recheck the solder side of the board at this point for any sharp, pointed connections. These connections will work their way through the paper insulation in time and cause malfunctions when they short to the microphone element.

Checking It Out

It is a good idea to check the performance of the circuit before you go to all the effort of assembling the case halves and installing the four retaining screws. The easiest way to check it is to put the transmitter on a seldom-used simplex frequency, connected to a dummy load, and then push the dial button while listening with another receiver. You should hear the seven-digit phone number transmitted at about six to eight digits per second. It should be transmitted only once, unless you hold the dial button down.

If everything seems normal, assemble the case halves together making sure that no wires get pinched in the process. This is a fairly snug fit; it needs just a slight bit of pressure to make the case halves fit completely together. If it requires heavy pressure, or if you feel that you are having to force things, then there is something wrong and you need to check for pinched wires, unclipped solder leads, large blobs of solder on the back, parts not inserted all the way into the board, etc.

Now that the case halves are assembled together, make the on-the-air test again to make sure nothing

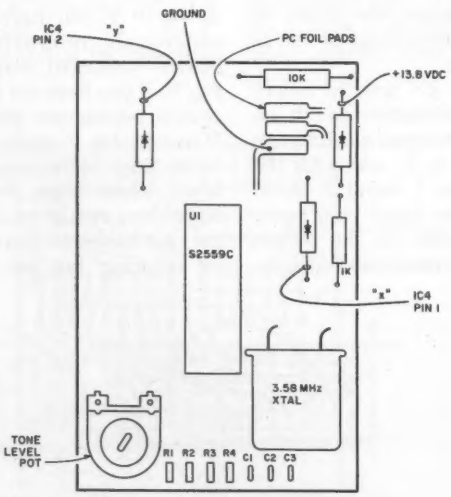

Fig. 9. The PCM-2000 DTMF generator.

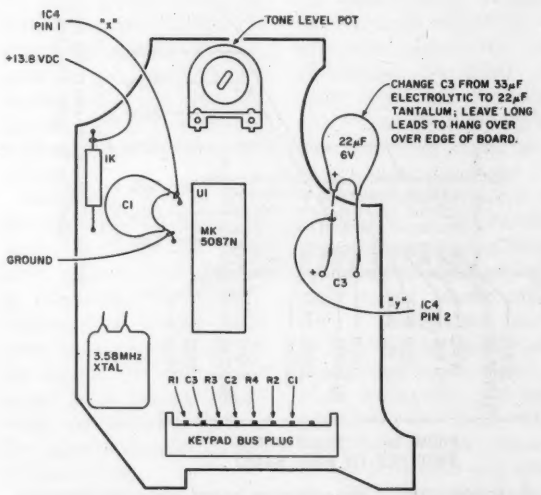

Fig. 10. The PCM-369 DTMF generator.

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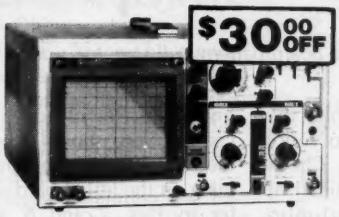

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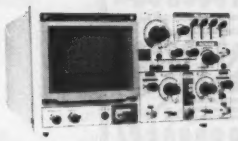

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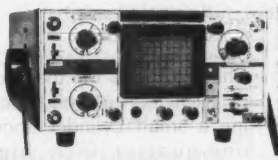

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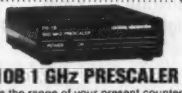

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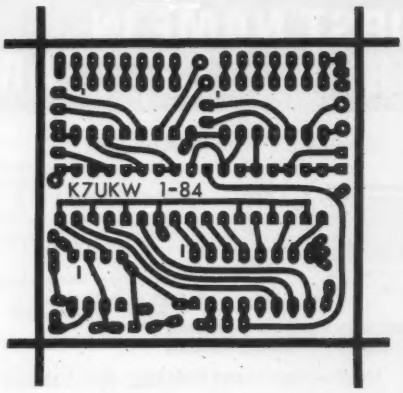


Fig. 11. Circuit pattern, full size, foil side.

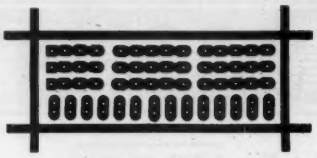


Fig. 12. Program-board pattern, full size, foil side.

got pinched or shorted. If this goes well, make a manual test of all the keys on the keypad. Another very important test to make is to check the power-up reset circuitry, C3 and CR10. Turn off your transceiver but leave the separate monitor receiver on. Now turn on the transceiver connected to the modified microphone. It should come up in the receive mode and should not transmit a string of tone digits. Repeat this several times to assure yourself that the modification will always power up in a standby mode.

The last and most important test is the on-the-air test. Call up your local patch, push the PTT bar, and tap the dial button. Make sure that it dials the number you expected. Repeat several times to be certain that it is consistent.

When you are satisfied that all is working properly, you are ready to put the finishing touches on the project. This consists of attaching a small cylinder about one-quarter inch high around the push-button dial switch. This prevents accidental dialing when reaching for the microphone or holding it in your hands. It will not allow a casual brush to trigger the switch, but an on-target finger tip can still very easily trigger the dial sequence when desired.

To Generate Digit	From Column	To Row
1	C1	R1
2	C2	R1
3	C3	R1
4	C1	R2
5	C2	R2
6	C3	R2
7	C1	R3
8	C2	R3
9	C3	R3
0	C2	R4

Table. 1. Jumper programming connections.

The material for this protection ring can be nearly anything you can imagine. I used a piece cut from the cap of a discarded Flair felt-tipped pen. After sanding the cut edges smooth, mix up some epoxy glue and attach the cylinder to the microphone case around the switch. It helps to rough up the microphone case first with a pin or sandpaper so that the epoxy can stick better. You can experiment with other types of adhesives, but the only thing I've found that will adhere to the plastic in these microphones is the two-part epoxy that you mix individually for each job. After the epoxy hardens, the ring can be painted black to match the rest of the microphone.

In Case of Difficulty

Troubleshooting and correcting problems are not too difficult if you keep in mind how the circuit operates and how it interconnects to the other microphone circuits.

If you have trouble, the first thing to do is to verify your power source. Check for +13 V dc (nominal) at IC1 form pin 8 to pin 1. Also check for +13 V dc from IC2 pin 16 to pin 8, and ICs 3 and 4, pin 14 to pin 7. This verifies the proper placement of the Vcc and ground jumpers on the board, too. I checked both circuits I made for proper operation over a varying voltage source and found them to be reliable from +8 V dc to +17 V dc. This is, of course, a much greater range than one would ever expect from an automobile system, but it perhaps will help eliminate any suspicions of malfunctions due to low (or high) battery voltage.

Check for a constant clock pulse on IC1 pin 3. This should be nominally 10 Hz. This waveform must be present as long as power is applied to the circuit. It should toggle to within at least 10 percent of the supply rails.

If a number is dialed, but it is the wrong number, first check that you can correctly dial the number manually using the built-in touch pad on the microphone. If this works properly every time you try, then the trouble must be in the circuit you have added, not in the DTMF generator or phone patch. Check to make sure that you have wired the digit-switching wires correctly between the main board and the number-program board. Refer to Figs. 5 and 7. Another possiblity is incorrect wiring between the program board and the row-and-column inputs of the existing DTMF chip. Refer to Fig. 7 and either Fig. 9 or Fig. 10 and double check. Of course, you should check the actual number programming on the little board—refer to Figs. 7 and 8, and Table 1.

Note that the telephone company has certain limitations concerning the speed at which we dial, the length of each digit, and the quiet space between each digit. Listen to your burst of digits; it should take about one second to send out all seven digits. If it takes significantly less time, you may be pushing the limits of the telephone company's equipment. Check R2 and C1 for correct values (Fig. 2).

If all these checks turn up nothing, try temporarily tacking a larger capacitor (something like 4 to 10 mF) across C1 on the main circuit board. This will greatly slow down the clock to the counter chip and allow you to follow in detail the digit generation sequence. Perhaps you can spot the trouble at this slower rate. This slower rate will also enable you to probe the output pins of IC2 during the digit sequencing to verify that IC2 is working properly. While listening to the sequence, make sure that there is a quiet period between tones of about the same duration as the tones are on. If not, check very carefully the orientation of all the diodes in the middle of the board. Refer to Fig. 6. Note that two of them are reversed from the others.

If you experience a dial sequence upon power-up, check that CR10 is not in backwards or open. Also make sure C3 is not open. If you can get no dial sequence or only part of a sequence, check that C3 is not

shorted. If the dial sequence runs over and over, suspect a shorted dial switch or connecting wires. This can also be caused by a leaky C3. Make sure the value of R3 is 10k Ohms.

If none of the above exercises seem to have helped, you must get tough and start isolating the board into sections to find where the trouble actually is.

Begin by getting the circuit into a quiescent state (not dialing). If yours already is, skip to the next paragraph. If not, unsolder the jumper wire from pin 14 of IC2. This removes the clock from IC2. Now power up the circuit and momentarily touch a wire from +13 V dc to pin 15 of IC2. This must reset IC2. Pin 3 of IC2 should now be high, and all other digit outputs (pins 2,4,7,10, 1,5,6,9, and 11) should be low.

Now turn on the monitor receiver and listen while performing the following checks. Using a 10k-Ohm resistor with one end tied to +13 V dc, touch the other end to each bilateral-switch control lead one at a time, while listening to the generated tone in the receiver. Using another DTMF generator (or a telephone held to your ear), compare the pitch of the tones and verify that the required tones are correct for each digit. For example, touch the 10k resistor to IC4 pin 5. This should key the transmitter and generate the first digit of your programmed phone number. If everything goes well here, then the program board, the bilateral switch ICs, and the connecting wiring are OK.

You can then proceed backward through the circuit, isolating each chip and verifying if it is doing what it is supposed to do. For example, with a valid clock input to IC2 pin 14, IC2 should count from 0 to 9 on each rising clock pulse. As each output goes high during its count, all other outputs must go low. This can actually be checked with a meter if the clock is slowed down sufficiently with a swamping capacitor as described earlier. When output 0 goes high, this high should be fed around through R3 to pins 15 and 13. This should clamp the chip at reset and disable the clock from any more counting.

All of this troubleshooting advice may seem a little intimidating and, in fact, is probably not really necessary. I have had no trouble at all with either of the circuits that I have built. If good quality parts and reasonable care in construction are used, you should be able to gleefully skip over all this dry, pessimistic troubleshooting information. But if that bug does find its way into your project, its nice to have a little guidance for locating the rascal.

Parts List

C1, C2	0.68-μF, 25-V tantalum	Jameco TM.68/35
C3	0.01-μF, 50-V disc ceramic	Jameco DC.01/50 or RS 272-131
C4*	22-μF, 6-V tantalum	Jameco TM22/6
CR1–CR10	1N4148 or 1N914 diode	Jameco 1N4148 or RS 276-1122
IC1	NE555V	Jameco NE555V or RS 276-1723
IC2	MC14017 or CD4017	Jameco CD4017 or RS 276-2417
IC3, IC4	MC14066 or CD4066	Jameco CD4066 or RS 276-2466
R1, R3	10k, 1/4 Watt, 5%	Jameco 10k-1/4W or RS 271-1335
R2	120k, 1/4 Watt, 5%	Jameco 120k-1/4
R4–R10	100k, 1/4 Watt, 5%	Jameco 100k-1/4 or RS 271-1347
SW-1	Submini SPST NO momentary switch, RS 275-1571	
Misc.	Printed-circuit materials, 30-gauge Kynar wire, epoxy glue, etc.	

*Note: C4 is used only if your microphone is the newer style PCM-369. See text.

Kynar wire is available from both listed sources.

Jameco refers to
Jameco Electronics
1355 Shoreway Road
Belmont CA 94002

RS refers to
Radio Shack
a division of Tandy Corp.

Using the Circuit

A good many of the local telephone autopatches in use today are simple, open machines that use a star (*) to bring them up and a pound sign (#) to shut them down. The autopatch for which I designed this circuit works that way, too. In this case, there is truly no reason to ever take one's eyes off the road to use the patch. The star (*) button is easy to find by feel, and a short burst after a proper ID is all that it takes to hear a dial tone. Once the dial tone is verified, a short squeeze on the PTT bar coupled with a fingertip tap on the dial button initiates the dialing sequence. Make sure that you release the PTT bar and dial button after no more than a half second—just a tap is all that it takes. If you hold the button in for more than about one second, you may trigger another burst of dialing. This won't generally bother the telephone equipment, but it sounds rather unprofessional over the air.

When your transceiver returns to the receive mode, you will either hear the phone ringing or a few seconds of clicking and then the ring-back, depending on how modern your local central office is. Our central office has not yet been upgraded to ESS (electronic-switching system) equipment, so all of the DTMF tones we dial have to be slowly converted to rotary-dial pulses before being fed into the phone equipment. That is the reason for the two- or three-second pause before the ring-back is heard. The reason that I mention this is because you normally don't hear it. This is because by the time you have manually pushed all the touch-pad buttons for your call (a relatively slow process), the tone-to-rotary conversion (if required in your exchange) has been nearly completed. When you stop dialing and listen, usually all that you hear is the last few clicks and then a ring-back.

When you dial with this speed-dial circuit, however, the tones are sent out so fast that only the first one or two digits have been converted by the time your receiver kicks back on. Hence you hear a relatively long (three to six seconds depending on the phone number) period of either silence or dialing clicks before the phone begins ringing. I mention this only so those individuals who are not familiar with the phone system won't panic or wonder if they got a wrong number before the phone finally rings.

Of course, when your call is finished, bringing the patch down is just as simple. The pound sign is easily located by feel and a quick jab is all it takes, followed by your call and any necessary logging. This can all be accomplished without ever taking your eyes away from traffic. If your local patch requires a security number to bring it up, rather than a simple star then, of course, this will require a brief glance at the touch pad. But the concentration and viewing required for dialing the actual phone number has been completely removed by this speed-dial circuit. ■

Don't Be A Kamikaze!

The Hara-Kiri Box is an improvement on the suicide cord that's still dangerous, but it's a lot safer than the cord.

Larry G. Ledford KA4J
553-4th Street SE
Cleveland TN 37311

Few hams will admit that they are foolish enough to use a suicide cord—a line cord with two alligator clips that is used to apply 110 volts ac for testing a transformer or motor. While it is very unhandy to properly set up a test jig to apply power for the testing of a component, it is equally unhandy to complete a project only to find that a component is defective or unsuitable (and have to replace it with a component of a different and often larger size).

The use of a suicide cord will tell you if the item is usable, but can kill in the process. You reach over to plug the cord in as one of the leads comes loose, and when you reconnect it, *zap!* your body becomes a conductor between the clip and the concrete floor.

The Hara-Kiri box is an improvement on the suicide cord that still is dangerous, but far safer than the cord. It is a unit that will allow you to apply power to a component momentarily or for extended periods of testing. It is protected from shorts by an automatically-resettable circuit breaker and has two indicator lights to warn if power is on or available. Both sides of the line are switched to protect you. When any two of its three switches are in the Off position, no voltage appears across the test clips or between either of the test clips and ground.

The only exotic component used in the Hara-Kiri box is the circuit breaker. This is a four-for-a-dollar hamfest item which apparently was surplus from a manufacturer of battery chargers. It looks like a large neon bulb. If you can't find one, use a 1-3-Amp fuse and holder.

Construction is standard except for the preparation of the test leads. The end of the zip cord is separated for about three inches with one side cut one inch shorter than the other. This is done so that if the clips should slip off the component under test, they cannot touch each other and cause a short. Due to the flexibility of the wire, they can be brought very close together. Should one clip come undone, the resiliency of the zip cord will spring it away from the other clip. Be sure to use the insulating boots on the alligator clips.

Label the switches as follows:

S1 Mains Off
Mains On
S2 A Steady On
S2 B Off
S2 C Push Switch
S3 Push On
I1 Mains On
I2 Live

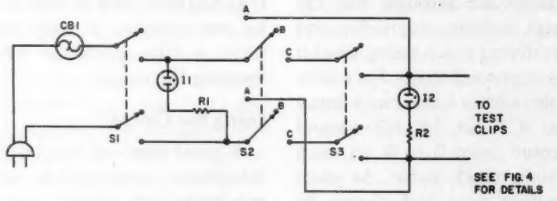
Also put a label stating: "Caution! Dangerous Voltge." My box also carries this warning: "Be Careful! Death Is So Permanent."

S1	S2 Position	S3	I1	I2	Ohmmeter Reading
Off	Off (B)	Off	Off	Off	0
On	Off	Off	On	Off	0
On	Steady (A)	Off	On	On	110 V ac
On	Push Switch (C)	Off	On	Off	0
On	Push Switch	On	On	On	110 V ac

Fig. 1.

S1	S2 Position	S3	Ohmmeter Reading
Off	Any	Off	High Ohms
On	B (Off)	Off	High
On	A (Steady On)	Off	Low Ohms
On	C (Push Switch)	Off	High
On	C (Push Switch)	On	Low Ohms

Fig. 2.



Note: all switches shown in the off position.

Fig. 3. Schematic.

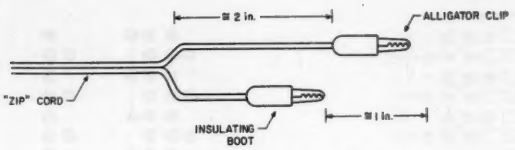


Fig. 4. Preparation of the test leads.

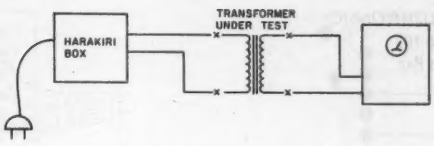


Fig. 5. Setup for using the Hara-Kiri box.

After you have finished wiring the box, it's important to run a series of tests to ensure that the box is safe to use. With the line cord disconnected from 110 V ac, connect the test clips together. Connect a VOM (in the Low Ohms position) across the blades of the line-cord plug. You should refer to Fig. 1 when operating the switches.

Any departure from the readings in Fig. 1 indicates either a defective switch or miswiring. Correct before continuing. If the readings are OK, then connect the VOM between one of the blades of the plug and one of the test clips. Since we are switching both sides of the line, there is a 50-50 chance that one of the VOM's leads will be connected to the wrong side. So if you can't get an indication on the ohmmeter, move the VOM lead to the other blade. Go through the switch sequences in Fig. 1. Readings should be the same. If they are, move the VOM leads to the other blade and the other VOM lead to the other test lead. Again, repeat the test sequence. If all is normal, then test for leakage between either of the plug blades (test one at a time) and the "bats" of the switches and the case (if you used a metal one). There should be no leakage.

Now give it a smoke test. Set the VOM for a 150-V-ac-or-more scale. Turn S1 off. Connect the test leads to the VOM. Plug the box into 110 V ac. You should have the readings in Fig. 2 on the voltmeter and indicator lights.

Turn S1 and S2 to the Off position. If the box has passed all the tests, it is now safe to use. While it may seem redundant to give this simple circuit this many tests, remember we are working with the one component that we cannot get an exact replacement for should we ruin it—*you!*

Using the Hara-Kiri box is simple and hopefully safe. Let's go through the procedure for testing an unknown transformer, which seems to be the component that I test the most often: Switch S1 (Mains) off. Switch S2 off. Plug the box into 110 V ac. For maximum safety, the box and the transformer should rest on an insulated surface. Connect the primary leads of the transformer to the test leads of the box. These are usually color-coded black. Place the VOM on the 1000-V-ac scale. This will protect the meter if the transformer has a high-voltage secondary.

Connect the VOM test leads to the transformer secondary. The leads of the VOM should have insulated alligator clips. It defeats the purpose of the box for you to hold on to the dangerous part of the circuit while applying power to it. Turn S1 on. I1 should light. Turn S2 to C (Push Switch). Push S3. I2 should light and the VOM should indicate some voltage. Release S3 and move the VOM to a lower scale for easier reading if necessary. Push S3 and note the reading. Release S3 and record the voltage of the secondary. Repeat for any other secondary windings.

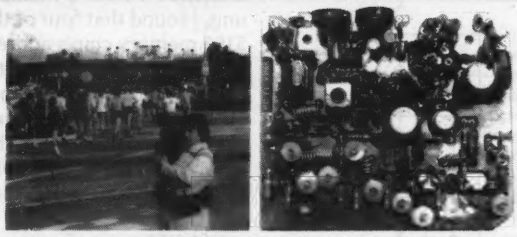
For continuous use, switch S2 to the A (Steady On) position. If I1 should go out while testing, then either the transformer is shorted or a short exists across the test leads. The circuit breaker has tripped. Switch S2 to the Off position and wait for the breaker to recycle; when it does, I1 will light up. When you are through using the box, turn S1 and S2 to the Off position.

The name Hara-Kiri is a dark humorous reference to the Japanese custom of ritual suicide, for which surely the box will not be used. The purpose of the box is just the opposite, to use a dangerous voltage safely. Always switch it off when not in use. The gradual change to transistors, with their lower voltages, may have lulled us into a position where we have lost our respect for dangerous voltages. ■

Parts List

CB1	3–4-Amp circuit breaker, automatic-reset type
S1	DPDT toggle switch
S2	DPTT toggle switch
S3	DPST or DPDT push-button switch with spring return
R1, R2	47–100k Ohms, ½ Watt
I1, I2	NE-2 neon bulb
Line cord	
3–4' of zip cord	
2 alligator clips with insulating boots	
Metal or plastic (preferred) case 2" × 4" × 6"	

AMATEUR TELEVISION



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132 Extra Memories for Your FT-107M

At three cents apiece, why not?

One of the very few operating inconveniences of the FT-107M is the necessity to change the memory switch when changing bands, unless you're lucky and the last 4 digits of the frequency coincide. This is the result of the storage system used by the transceiver. Internally, the memory unit counts the vfo frequency and stores the last four digits into 4 CMOS memories. When you use (recall) a frequency from this memory, a synthesizer contained in the memory unit replaces the vfo and synthesizes the frequency stored.

If you were operating, for example, on 7.1505 MHz, the memory unit stores only the last four digits (1505). Switching bands to 15 meters you get 21.1505 MHz on the display. On 10A you'd get 28.1505 MHz, etc.

Recently, while repairing a friend's FT-107's memory unit, I found that four of the 5101 memory chip's address lines are not used. Of the total of eight lines, only four are used to select the memory channel number; the other four go to +5 volts through 2.2k pull-up resistors. Reasoning that four extra lines give 16 extra possibilities, and needing only 12 (12 bands), there was the solution, ready to use.

The Circuit

The easiest way to code 12 bands (160, 80, 40, 20, 15, 10A, 10B, 10C, 10D, Aux1, Aux2, and JJY, the latter three having been modified for the new 30-, 17-, and 12-meter bands) into four lines is using a diode matrix. I wanted to use as few diodes as possible so I made up Table 1 first.

There's one code that doesn't use a diode, 4 codes that use 1 diode, and 6 codes that use 2 diodes. That totals 11, indicating the necessity to use one code with 3 diodes. Total diodes used in the coder: 19. The diode matrix is shown in Fig. 1.

The bandswitch is connected to a +8-volt supply, and the memories work on a separate +5 volts. A voltage translator was needed to convert the voltages and to isolate any possible timing problem between both supplies. A simple transistor inverter was chosen. No collector resistors are needed, as they are supplied by Yaesu in the form of the 2.2k pull-ups (Fig. 2).

Construction

When doing any work inside the transceiver, switch power off and take the plug out of the wall socket, both for the safety of the operator and the integrated circuits.

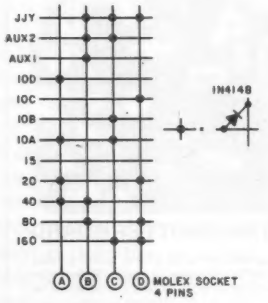

Fig. 1. Diode matrix.

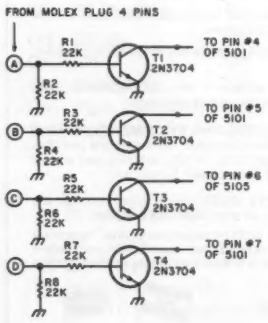

Fig. 2. Inverter/level translator.

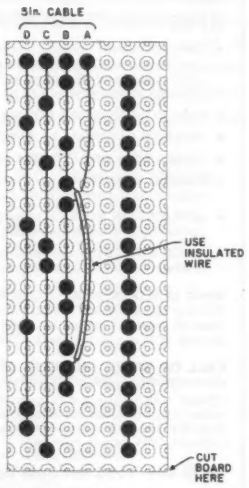

Fig. 3. Diode-matrix wiring pattern, foil side.

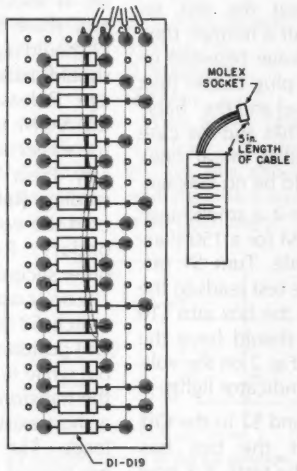

Fig. 4. Diode-matrix construction, component side.

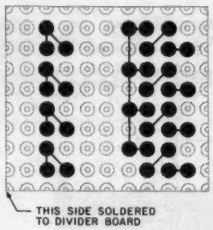

Fig. 5. Inverter/level translator board, foil side.

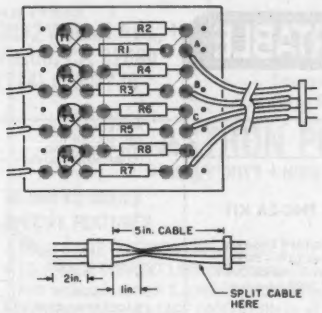

Fig. 6. Inverter/level translator board, component side.

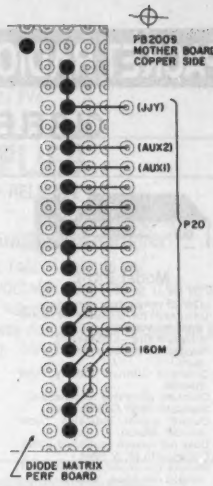

Fig. 7. Diode-matrix board pinout.

Both circuits were constructed on .1" perforated PC board (Veroboard or similar). Mount the diodes as in Fig. 4 to allow easy installation afterwards. Connect the cable to the board before mounting it inside the transceiver. On the inverter board, mount the transistors as close to the board as possible, or the board won't enter into the memory unit. Do connect the cable to the inverter board, but *without* the plug (you will have to pass the cable through one of the holes of the memory unit's enclosure first). Split this cable in two pairs.

Length of the wiring is of no great concern, but the construction as shown in the Figs. is probably the easiest.

Installation

In order to install both boards it will be necessary to remove both the top and bottom covers of the FT-107M (8 screws each). First remove the handle (2 screws).

The diode matrix fits on rf mother board PB-2009 (bottom side of the FT-107M) alongside the solder points of P20. On this plug, all the bandswitch points are available (see Fig. 7). When all the connections between the diode matrix and P20 are made, the construction is rigid enough to stay put without any other mechanical support.

The inverters were installed inside the memory unit. To take out the memory unit (metallic box near the speaker), it's easier to take off the black plastic cover of the rf unit and local unit.

Take off the cover of the unit on the component side. A 2.5 × 25 mm (.1" × 1") border of the protective paint of the divider unit is scraped off with a small knife. (The divider unit, PB-2084, is the small PC board which is upside down near the top of the box.) Then the inverter board is soldered side to side with the divider unit, as shown in Fig. 8. You can take out the divider unit to pass the cable through one of the top holes of the memory unit's box. Then install the divider unit again in the box and affix the plug to the end of the cable. Solder the four separate cables to the 5101 chips, as shown in Fig. 8.

Now close the memory unit again and install it inside the transceiver.

Testing

Connect the two cables together (the one coming from the diode matrix and the one going to the inverters). Don't worry about the polarity. Either way you plug it in, it will work.

Turn on the transceiver, set it on 20 meters, and set the memory switch to channel 1. Try to save and recall a frequency (say 14.1111 MHz). Now switch to 15 meters and store, *in the same memory channel*, another frequency (say 21.2222 MHz). Going back to 20 meters and recalling memory 1, it should still read 14.1111 MHz.

Now try some other com-

Number	Binary Code	Number of Diodes
0	0000	0
1	0001	1
2	0010	1
3	0011	2
4	0100	1
5	0101	2
6	0110	2
7	0111	3
8	1000	1
9	1001	2
10	1010	2
11	1011	3
12	1100	2
13	1101	3
14	1110	3
15	1111	4

Table 1.

Bandswitch	Cable A	B	C	D	5101 Pin 4	5	6	7
JJY	0	1	1	1	1	0	0	0
AUX2	0	1	1	0	1	0	0	1
AUX1	0	1	0	0	1	0	1	1
10D	1	0	0	0	0	1	1	1
10C	0	0	0	1	1	1	1	0
10B	0	0	1	0	1	1	0	1
10A	1	0	1	0	0	1	0	1
15	0	0	0	0	1	1	1	1
20	1	0	0	1	0	1	1	0
40	1	1	0	0	0	0	1	1
80	0	1	0	1	1	0	1	0
160	0	0	1	1	1	1	0	0
	1 = > 7 volts 0 = 0 volts				1 = 5 volts 0 = 0 volts			

Table 2.

Parts List

D1-19	1N4148 (1N914)	Any small switching diode
R1-8	22k, 1/4 Watt	
T1-4	BC547	Any small-signal NPN transistor
P1, S1		4-pin plug and socket

10" of 4-strand flat cable or 40" of single-strand cable
Perfboard (see Figs. for size)

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- Designed for portable or solar-powered stations.
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- Rugged all metal, shielded enclosure.
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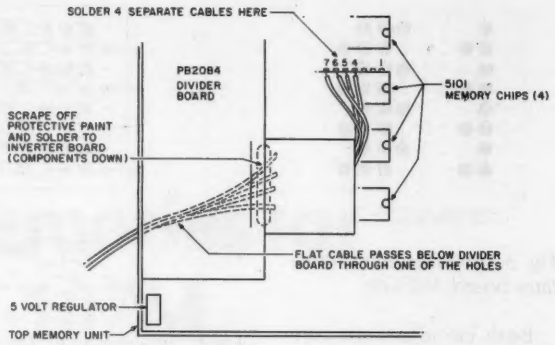

Fig. 8. Inverter board placement.

binations. No combination should alter the contents of any other band or memory number. If you have any problems, they will probably be wiring errors in the diode matrix. Use Table 2 to debug any wiring error or faulty diode.

Finally

Why so many memories? That is probably what Yaesu thought when they left them out in the first place. Now, an owner of an FT-107M can store the emergency frequency for each band on channel 1. He can scan these frequencies using only the bandswitch (the memory switch remains on channel 1).

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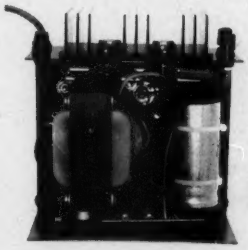

INSIDE VIEW – RS-12A

RS and VS SERIES

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
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- RIPPLE: Less than 5mv peak to peak (full load & low line)

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM-A Series

MODEL RM-35A

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Model	Continuous Duty (AMPS)	ICS* (AMPS)	Size (IN) HXWXD	Shipping Wt. (lbs.)
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• SEPARATE VOLT & AMP METERS				
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W X D	Shipping Wt (lbs)
RS-4A	3	4	3¾ x 6½ x 9	5
RS-7A	5	7	3¾ x 6½ x 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 x 7½ x 10¾	11
RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13¾ x 11	46

RS-M SERIES

MODEL RS-35M

• Switchable volt and Amp meter

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12M	9	12	4½ x 8 x 9	13
RS-20M	16	20	5 x 9 x 10½	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13¾ x 11	46

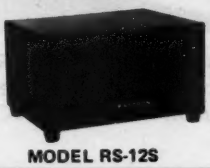
VS-M SERIES

MODEL VS-20M

- Seperate Volt and Amp Meters
- Output Voltage adjustable from 2-15 volts
- Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16	9	4	20	5 x 9 x 10½	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES



MODEL RS-12S

• Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7S	5	7	4 x 7½ x 10¾	10
RS-10S	7.5	10	4 x 7½ x 10¾	12
RS-10L(For LTR)	7.5	10	4 × 9 × 13	13
RS-12S	9	12	4½ x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18

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Inside CoCo's ROMpak

Store your favorite Color Computer programs in ROM—and never type "Load" again.

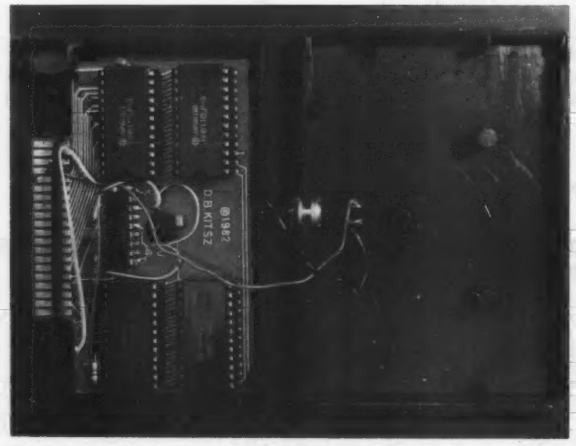


Photo A. A RAM pack configured to give 8K of RAM at the cartridge port. The switch is a "Comprise" auto-execute (see text).

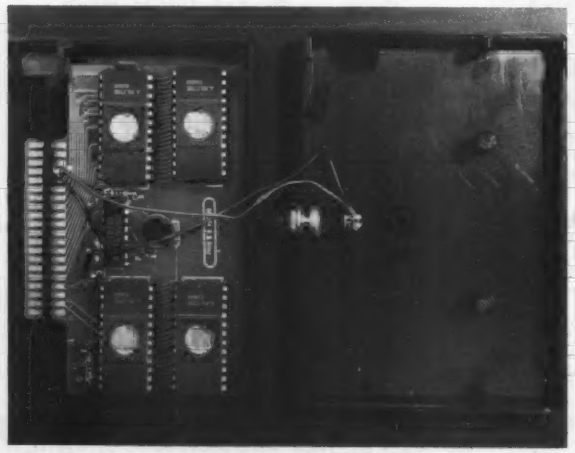


Photo B. A ROM pack configured with 16K of EPROM.

Mailboxes for HF and VHF are becoming more and more popular. As participation increases, there is a growing wealth of information available. In most areas, RTTY pictures, programs, bulletins, and public-domain programs are all available.

There is a tremendous advantage to having the proper software to access these systems. A good program needs

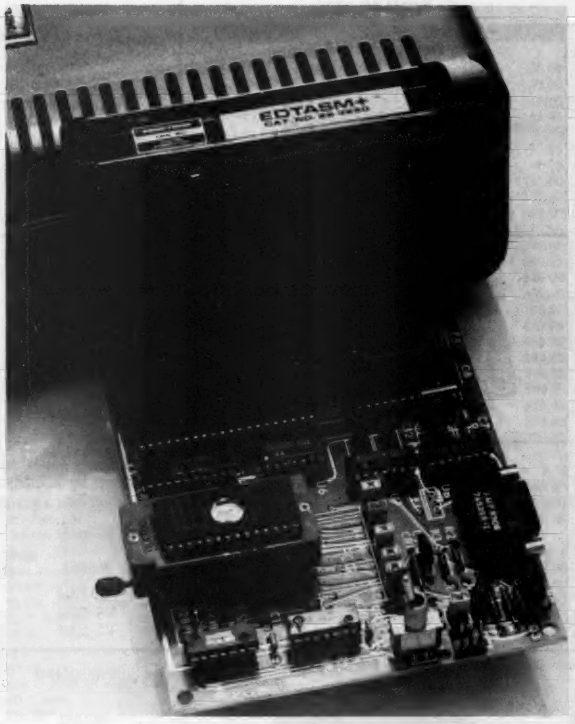


Photo C. The CRA and Associates Universal EPROM Programmer. This unit can be considered a complete development system. It also offers protection to the CoCo via full buffering.

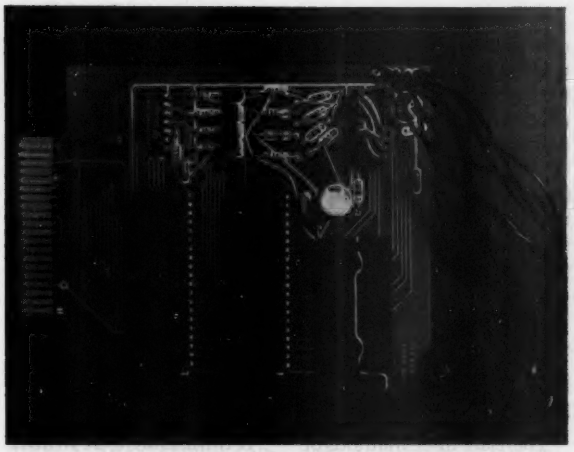
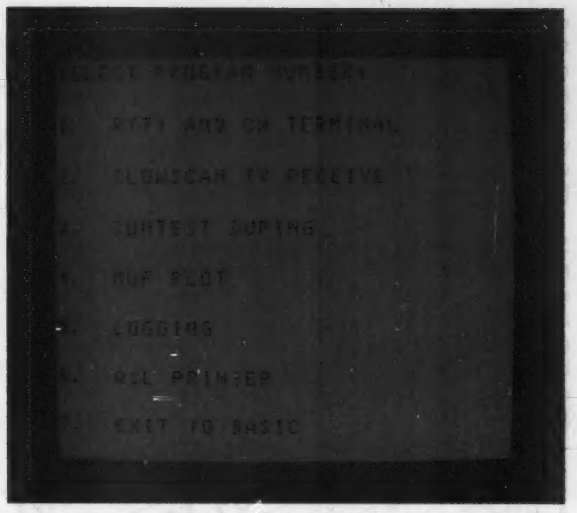


Photo D. The Green Mountain Micro Color Burner—one of the least expensive burners, available in kit form.



A dramatization of what can be programmed. (I wish I possessed a ROMpak with these programs!)

both a transmit and a receive buffer that can be saved and loaded. Using a program which prints only the information you receive can cause you quite a bit of typing should you decide you want to use it again.

The program that I use can be loaded from disk or tape. The program is long—7,341 bytes. A second CoCo is used for my amateur radio operations. I used to hesitate turning that computer off when it was not in use. After each power-down, a long tape load would precede any amateur activity. For this reason, I began searching for a way to keep the program in non-volatile ROM and be able to run it from a ROM pack. Here's how I did it; I call it ROMpak.

The Program

If your program normally runs in memory after a tape or disk load, the chances are that you will not be able to burn it into ROM and run it there. However, you can *store* your program in ROM. If you had a program that would transfer it back to where it should be in RAM and execute it, you would eliminate the tape load.

This is exactly what the loading program does. Once executed, it prints a menu screen with the titles for your programs. You choose the program you want, and the loader puts it into RAM and executes it.

The program as it appears will not do the trick. To make it work you will need to do a little paperwork and figuring. The program itself will require modification.

First, type it as it stands. You will want to assemble it to check for errors. If it is assembled as it sits, EDTASM will give you a wheelbarrow full of BAD MEMORY errors. EDTASM recognizes that you are trying to write to the ROMpak and will tell you that is a no-no. Change line 190 to read:

```
190  ORG  $1000
```

Now try an assembly with the following switches: A/IM/WE/AO. If everything checks, change line 190 back to the original and save the source code.

Your Programs

Although Basic programs can be loaded and run in this manner, this program will work only with machine-language programs. You will need a number of addresses from each of these programs:

1. Where the program begins in RAM.
2. Where it ends.
3. Its length.
4. Where it executes.
5. Where to load it into the ROMpak.

From Basic, CLOADM one of the programs. Do not execute it, but return to Basic. The starting address of this program can be found by typing:

```
PRINT PEEK (&H1E7)
```

and

```
PRINT PEEK (&H1E8)
```

The first value is the most significant byte. Each of these will have to be changed to hex using EDTASM's Z-Bug calculator and concatenated. The ending address is given by:

```
PRINT PEEK (&H7E)
```

and

```
PRINT PEEK (&H7F)
```

The execution address is given by:

```
PRINT PEEK (&H9D)
```

and

```
PRINT PEEK (&H9E)
```

In Z-Bug, calculate the program's length. Enter this information in the worksheet (Fig. 1). Do this for all of the programs you wish to load into the ROMpak.

Modifying the Loader

The loading program requires a number of modifications before we can determine its length. Load the source code and print the menu lines. Modify these with the names you wish to use with each program. You may have more than seven programs to load, in which

ROMpak Formatting Worksheet

Name of Program	Starting RAM Addr. LD#TO	Ending RAM Addr.	Length of Progr. LENGTH#	Exec Addr. EXEC#	Starting ROM Addr. STPG#	Ending ROM Addr.
Loader						
Program #1						
Program #2						

Fig. 1. ROMpak formatting worksheet.

case you will have to expand the menu. If you have fewer than seven and you wish to load more into the ROMs at a later date, the area of ROM where the future menu lines will reside will have to be left blank.

The lines reading FDB $0D0D simply space the menu lines apart on the screen. The program looks for a "$FF" value to end the menu screen. This can either be put in (as in the program) or assumed as unburned ROM.

Once the menu has been modified, type A/AO. As the assembler scrolls the screen, it can be made to pause by pushing both the <shift> and <@> keys. The last byte of the menu, the "$FF" character, is the last byte of the program. By pausing the scrolling when this part of the program is on the screen, the ending address of the loader can be determined. Knowing that the start is at $C000, you now can complete the worksheet. You can also determine this ending address by assembling the source code to the printer (A/LP).

Once the worksheet is complete, enter the values into the source code that the program will need. If you are planning on expansion, remember that you will probably have to make two burn passes. The first will start at $C000 ($0000 relative to the start of the ROM). The second pass will leave the future menu lines unburnt and start loading in the stored program code for the first program.

Building the ROMpak's Code

There are three methods of building the code that will go into the ROMpak. The first is to use the computer's RAM, pretending that some arbitrary byte is actually $C000. Then, using the Z-Bug "P" command, make a copy of the memory.

Since the loader is not memory-independent, you will not be certain that the program will work at its proper address until you have the ROMs burnt. Then it's too late. Double and triple check any code put together this way.

A much more desirable

```
0100 *
0110 * ROMPACK OPERATING SYSTEM
0120 *
0130 * BY STEPHEN W. WOLF
0140 *
0150 * THIS PROGRAM IS PUBLIC DOMAIN
0160 *
0170 *
0180 *
0190         ORG    $C000
0200 *
0210 * LOAD PROGRAM VARIABLES HERE
0220 *
0230 STPG1   SET    $3000     LOCATION OF PROGRAM ONE IN ROMPAK
0240 LD1TO   SET    $4000     LOAD ONE TO RAM FROM HERE
0250 LENTH1  SET    $0100     LENGTH OF PROGRAM ONE
0260 EXEC1   SET    $C000     EXECUTION ADDRESS OF FIRST PROGRAM
0270 *
0280 STPG2   SET    $3000
0290 LD2TO   SET    $4000
0300 LENTH2  SET    $0100
0310 EXEC2   SET    $C000
0320 *
0330 STPG3   SET    $3000
0340 LD3TO   SET    $4000
0350 LENTH3  SET    $0100
0360 EXEC3   SET    $C000
0370 *
0380 STPG4   SET    $3000
0390 LD4TO   SET    $4000
0400 LENTH4  SET    $0100
0410 EXEC4   SET    $C000
0420 *
0430 STPG5   SET    $3000
0440 LD5TO   SET    $4000
0450 LENTH5  SET    $0100
0460 EXEC5   SET    $C000
0470 *
0480 STPG6   SET    $3000
0490 LD6TO   SET    $4000
0500 LENTH6  SET    $0100
0510 EXEC6   SET    $C000
0520 *
0530 * PRINT MENU AND GET PROGRAM NUMBER
0540 *
0550 RETURN LBSR   $A928     CLEAR THE SCREEN
0560        LDX    #MENU     ADDRESS OF START OF MENU
0570 PRINT  LDA    ,X+       OBTAIN MEMORY
0580        CMPA   #$FF      <$FF> IS DELIMITER
0590        BEQ    GETCHR    DONE
0600        JSR    $A282     ROM PRINT TO SCREEN
0610        BRA    PRINT     NEXT CHARACTER
0620 GETCHR JSR    $A1C1     CHECK THE KEYBOARD
0630        BEQ    GETCHR    UNTIL A # IS PRESSED
0640        LBSR   $A928     CLEAR THE SCREEN AGAIN
0650 *
0660 * COMPARE + LOAD ONE TO SEVEN
0670 *
0680 BACK0  CMPA   #$31      FIRST PROGRAM?
0690        BNE    TWO       GOTO #2
0700        LDX    #STPG1    START ADDRESS IN ROMPAK
0710        LDY    #LD1TO    ADDRESS TO LOAD IT TO
0720        LDU    #LENTH1#  BYTES IN PROGRAM
0730        LBSR   MOVE      MOVE IT
0740        JMP    EXEC1     EXECUTE #1
0750 *
0760 TWO    CMPA   #$32
0770        BNE    THREE
0780        LDX    #STPG2
0790        LDY    #LD2TO
0800        LDU    #LENTH2
0810        BSR    MOVE
0820        JMP    EXEC2
0830 *
0840 THREE  CMPA   #$33
0850        BNE    FOUR
0860        LDX    #STPG3
0870        LDY    #LD3TO
0880        LDU    #LENTH3
0890        BSR    MOVE
0900        JMP    EXEC3
0910 *
0920 FOUR   CMPA   #$34
0930        BNE    FIVE
0940        LDX    #STPG4
0950        LDY    #LD4TO
0960        LDU    #LENTH4
0970        BSR    MOVE
0980        JMP    EXEC3
0990 *
1000 FIVE   CMPA   #$35
1010        BNE    SIX
1020        LDX    #STPG5
1030        LDY    #LD5TO
1040        LDU    #LENTH5
1050        BSR    MOVE
1060        JMP    EXEC5
1070 *
1080 SIX    CMPA   #$36
1090        BNE    SEVEN
1100        LDX    #STPG6
1110        LDY    #LD6TO
1120        LDU    #LENTH6
1130        BSR    MOVE
1140        JMP    EXEC6
1150 *
1160 * BASIC CALL
1170 *
1180 SEVEN  CMPA   #$37
1190        LBNE   RETURN    ILLEGAL PROGRAM NUMBER
1200        CLR    <$71      CLEAR COLD START FLAG
1210        LDX    #$A027    START OF BASIC
1220        JMP    ,X        JUMP TO BASIC
1230 *
1240 * MOVE SUBROUTINE
1250 *
1260 *   -X:  FROM ADDRESS
1270 *   -Y:  TO ADDRESS
1280 *   -U:  # OF BYTES
1290 *
1300 MOVE   LDA    ,X+       BYTE TO BE MOVED
1310        STA    ,Y+       MOVE IT TO NEW MEMORY
1320        LEAU   -1,U      DECREMENT U
1330        CMPU   #$0000    DONE?
1340        BGE    MOVE      NO
1350        RTS              YES
1360 *
1370 * THE MENU SCREEN INFO FOLLOWS:
1380 *
1390 MENU   FCC    /SELECT PROGRAM NUMBER:/
1400        FDB    $0D0D
1410        FCC    /1.  TITLE OF FIRST PROGRAM/
1420        FDB    $0D0D
1430        FCC    /2.  TITLE OF SECOND PROGRAM/
1440        FDB    $0D0D
1450        FCC    /3.  TITLE OF THIRD PROGRAM/
1460        FDB    $0D0D
1470        FCC    /4.  TITLE OF FOURTH PROGRAM/
1480        FDB    $0D0D
1490        FCC    /5.  TITLE OF FIFTH PROGRAM/
1500        FDB    $0D0D
1510        FCC    /6.  TITLE OF SIXTH PROGRAM/
1520        FDB    $0D0D
1530        FCC    /7.  EXIT TO BASIC/
1540        FCB    $0D
1550        FCB    $FF
1560        END
```

Program listing.

method is to use a RAM pack. This is a ROM pack configured with RAM. Photo A shows a Green Mountain Micro RAM pack configured for the 6116 chip. This gives 8K of memory at the port. 16K can be addressed there and this same RAM pack can be modified to accept four 6116s (piggyback) to have 16K available. (Write to Green Mountain Micro at Bathory Road, Roxbury VT 05669.

If a RAM pack is used, a simple modification to the computer will have to be made. A stock computer cannot write to addresses $C000 to $EFFF. Different RAM packs give different instructions to do the modification. The most simple method to allow the RAM pack's use is to ground pin five of the 74138 multiplexer (U10) through a switch. I have seen other methods that cut pins and use other "no-turning-back mods." Some of these will affect memory map number one in such a way that it cannot be used. That will make full RAM programs, like the VIP Library, useless. Don't cut pins.

The third method entails copying addresses $8000 to $FEFE into the unused 32K of RAM in the 64K chips. This was done by Ray Guavreau in the January, 1984, issue of *Rainbow* magazine (PO Box 209, Prospect KY 40059). You then switch to all RAM and can use the computer's upper RAM to simulate a ROM pack.

My code was assembled in a RAM pack, and this is the way it was done. EDTASM is position-independent and can run anywhere in memory above about $1000. Copy it to RAM by using a U C000 1000 27FF command. It then can be saved to tape with P 1000 27FF 1000. The RAM pack can now be used with EDTASM.

Make an object code tape of your loader. Load this from Z-Bug into the RAM pack. As each of your programs is moved into the loader, you will have to ensure that they do not cream EDTASM. For example, if EDTASM is running at $1000 and you try to load a program in at $1E01, you will load over EDTASM and crash the system. It may be necessary to move EDTASM all over the computer as you proceed.

Load your program into memory using Z-Bug. Move them into the RAM pack with the "U" command. After they are are all loaded, make a tape print of the RAM pack with P RAMPAK C000 (hex address of last byte of last program) C000.

The acid test is to now power down and bring the system back up, reloading the RAM pack. Check each program thoroughly to see that everything is working. If you do find a program which crashes, go back to the worksheet and recalculate all values. Hex numbers are tricky.

ROM Packs

Photo B shows a Green Mountain Micro ROM pack configured with 16K of 2732 EPROM. I have two programs burnt which occupy about 9K. This leaves about 6K for future expansion. (Come on people! Let's see some packet software for the 6809 Color Computer!)

Autostart on a typical ROM pack is achieved by shorting pin seven to pin eight on the connector. The pin assignments go top-bottom-top-bottom so these two pins are above and below one another on the ROM pack. If this is done each time the computer is powered up, it will execute $C000 automatically. Rather than allow it to do that, I have installed a push-button between these two pins. By tapping the button, it effectively does an EXEC &HC000 command. I still can get back into Basic for my day-to-day needs without a power-down and removal of the ROMpak.

PROM Burners

PROM burners used to be $500.00 devices that required an excellent fluency in hex numbers. That has changed.

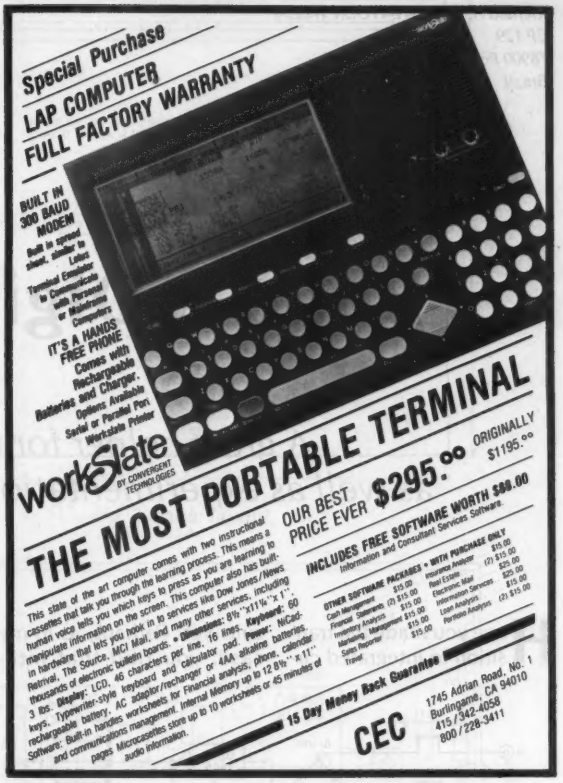
One of the cheapest available burners is available from Green Mountain Micro; it can be purchased in kit form, and except for four transistors is easy to build. These four transistors have extremely close lead spacing and require the utmost care in soldering. The software that can be purchased will allow you to program at least six types of EPROM including a 68764. This last EPROM can be put into one of the sockets used for Basic or Extended Basic.

For a development system, CRA & Associates (31235 Avon Road, Westlake OH 44145) offers a "Universal EPROM Programmer" for the CoCo. A number of bells and whistles are built into this board. First and foremost, a program pack connector is built onto the board. This allows the EDTASM to remain on the board and available. A (true) RS-232 port capable of up to 19.2 KB is also standard. This could be used to burn ROMs for use in other non-6809 systems. Everything on the board is socketed. Protection is obtained through full buffering and current limiting on the program pulse. What else could you ask for?

I cannot detail how the code is burnt into the ROM since each burner is different. All have software available. They show how to take your object tape and put it into ROM.

Conclusion

When I have a few free minutes, I like to pop down to the shack and get into a QSO. The ROMpak has relieved me of the hassle of a tape load to bring up my terminal. Also, I am no longer hesitant to power down after each operation. It is a nice system that could easily be implemented by software designers to put their programs into a ROM pack. ■



Richard A. Need WB4YOD/PW8ZAF
CP 129
78900 Porto Velho, RO
Brazil

Build A Digital IC Trainer

A great helper for testing components, as well as experimentation and circuit development.

Have you made the transition to integrated circuits yet? Perhaps, as in my case, you find that integrated circuits aren't quite as convenient for the experimenter as has been rumored. Let me explain that bit of heresy.

With discrete components, you can throw together a simple circuit quickly by tacking the component leads together as required; with an integrated circuit, the leads are so close together that such an approach invites short circuits and component destruction. The answer to that problem is a trainer designed for digital integrated-circuit experiments.

As I considered the requirements for an IC trainer for myself, I came up with the following as features that should be provided:

- Sockets to accommodate standard ICs with from 8 to 40 pins
- Switches for use in setting up inputs to the experimental circuits
- LED indicators
- Internal pulse generator to provide pulse train for input to experimental circuits
- Internal power supply
- Interconnections in setting up experimental circuits made by jumpers and requiring no soldering

The most convenient socketing arrangement I could find to suit my requirements was a modular

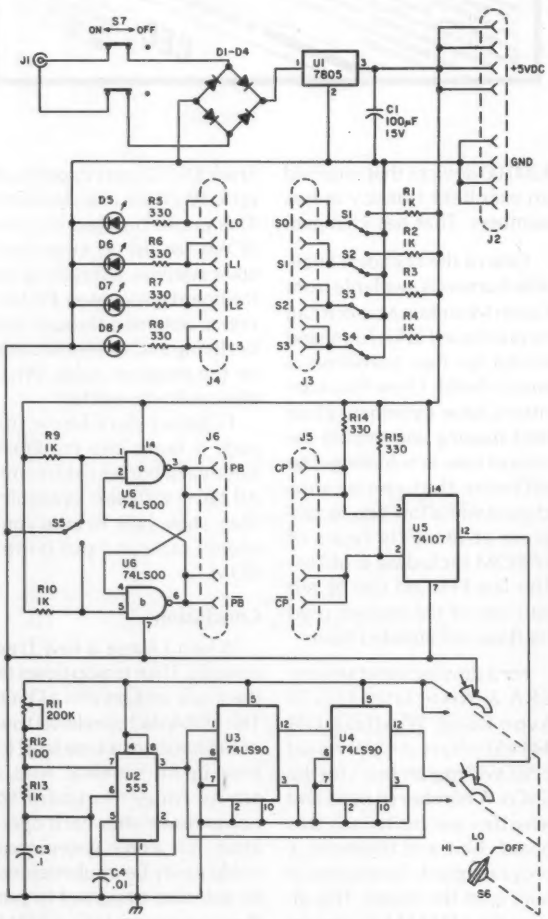
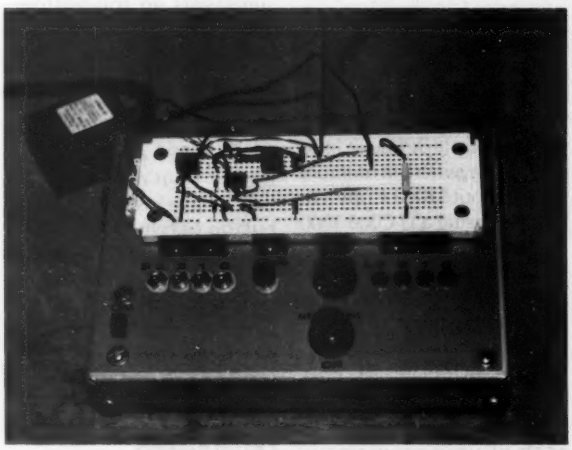


Fig. 1. Digital IC trainer schematic.



The digital IC trainer.

IC breadboard socket such as marketed by Radio Shack. This socket has 550 holes with the same spacing as the pins on common ICs. There are 47 columns of 5 holes which are connected internally in both the upper half and the lower half of the socket. Any of the standard integrated circuits can thus be inserted in the socket astride the center divider and each of its pins will be connected to a column of connection points. Across the top and bottom of the socket are rows of holes connected together horizontally to serve as power-bus connections. Connections can be made to the socket by 22- to 30-gauge solid-wire jumpers.

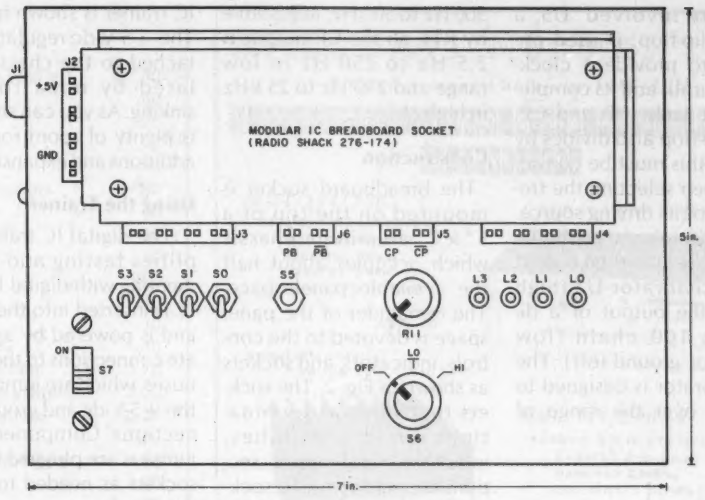


Fig. 2. Panel layout.

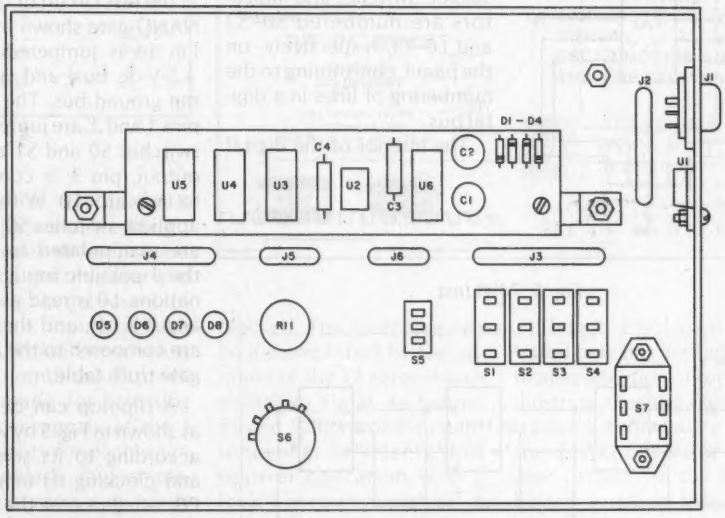


Fig. 3. Interior view showing major components.

Circuit Description

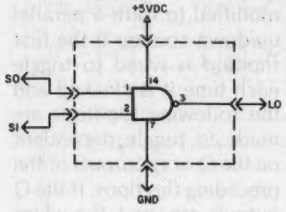
The circuit used is shown in Fig. 1. A power section is provided as well as a switch section, an indicator section, and a pulse-generator section.

The power section has no transformer since there wasn't enough room in the chassis I selected. Instead, the input is connected to a full-wave bridge whose output is regulated by U1 to +5 V dc. The power source connected to J1 can be any voltage from 7 to 35 volts, the limits of the regulator. If the input is ac, the diode bridge serves as a rectifier. If the input is dc, the diode bridge serves as an automatic switch to connect the proper polarity, so it doesn't matter what polarity is connected to J1.

Four SPDT toggle switches, S1–S4, are provided to select between +5 V dc and ground to provide either logic 1 or logic 0 at the jacks labeled S0 to S3. Limiting resistors R1 to R4 prevent catastrophic failures provoked by connecting +5 V dc with 1 Ampere capability to the test sockets. A push-button switch, debounced by the NAND gate circuit, provides a push-button output and its complement at the jacks labeled PB and $\overline{PB}$.

Four red light-emitting diodes are used as logic-level indicators accessible by connection to jacks labeled L0 to L3. Limiting resistors R5 to R8 are insurance against LED failure and are selected to limit current through these indicators to the specified value even when the full dc voltage available is connected to them.

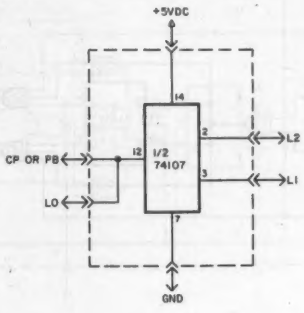
The pulse generator is a



NAND GATE TRUTH TABLE

S1	S0	LO
0	0	1
0	1	1
1	0	1
1	1	0

Fig. 4. 7400 test.



CP	L2	L1
* ↓	1	0
↓	0	1
↓	1	0

* ↓ DENOTES NEG. TRANSITION

Fig. 5. 74107 flip-flop test.

bit more involved. U5, a 74107 flip-flop, is used primarily to provide a clock-pulse output and its complement at jacks CP and $\overline{CP}$. This flip-flop also divides by two, so this must be considered when selecting the frequency of its driving source. Switch S6 selects, as the input for U5, either the output of multivibrator U2 (high range), the output of a divide-by-100 chain (low range), or ground (off). The multivibrator is designed to operate over the range of 500 Hz to 50 kHz, adjustable by R11, so the CP output is 2.5 Hz to 250 Hz in low range and 250 Hz to 25 kHz in high range.

Construction

The breadboard socket is mounted on the top of a 5″ × 7″ aluminum chassis which occupies about half the available panel space. The remainder of the panel space is devoted to the controls, indicators, and sockets as shown in Fig. 2. The sockets that serve as terminations for the switches, indicators, and power sections are made from IC sockets so that they will be similar to the breadboard socket. Switches and indicators are numbered S0–S3 and L0–L3, respectively, on the panel, conforming to the numbering of lines in a digital bus.

The interior of the digital IC trainer is shown in Fig. 3. The +5-V-dc regulator is attached to the chassis, insulated by mica for heat sinking. As you can see, there is plenty of room for future additions and expansions.

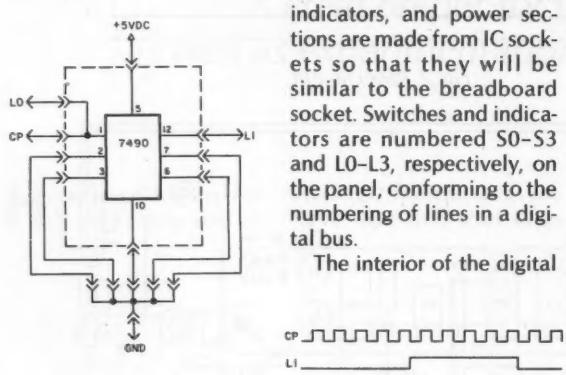


Fig. 6. 7490 test.

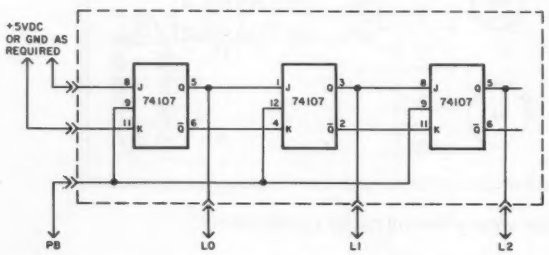


Fig. 7. Shift register development.

Using the Trainer

The digital IC trainer simplifies testing and experimenting with digital ICs. The IC is inserted into the socket and is powered by appropriate connections to the power buses, which are jumpered to the +5-V-dc and ground connections. Components and jumpers are plugged into the sockets as needed to set up the circuit.

As a simple example, look at the test circuit of the 7400 NAND gate shown in Fig. 4. Pin 14 is jumpered to the +5-V-dc bus, and pin 7 to the ground bus. The inputs, pins 1 and 2, are jumpered to switches S0 and S1 and the output, pin 3, is connected to indicator L0. With power applied, switches S0 and S1 are manipulated to set up the 4 possible input combinations. L0 is read as 1 if on and 0 if off, and the results are compared to the NAND-gate truth table.

A flip-flop can be tested as shown in Fig. 5 by wiring it according to its schematic and clocking its input with PB, using one of the indicators to monitor its output for proper toggle action.

A counter, such as the 7490, can be tested as shown in Fig. 6. Its input can be clocked using CP at a low frequency—or PB can be used so that the division ratio can be determined.

Though useful for testing ICs, the digital IC trainer has been most valuable to me in experimentation and circuit development. For example, I was asked to design a three-flip-flop shift register capable of serial data entry, complement operation, up-count, and down-count. While some, no doubt, find it possible to design entirely on paper and then to build a working circuit, I much prefer to take a project such as this in smaller steps. The digital IC trainer is ideally suited for developing a circuit in steps and provides a means for testing each step before proceeding.

A serial shift register is made by connecting J-K flip-flops so that the inputs to the first flip-flop can be manipulated to clock in a 1 or a 0 and the state to which each succeeding flip-flop will clock is determined by the state of the previous flip-flop. Such a shift register is shown in Fig. 7. The jumpers shown indicate connections from appropriate holes in the breadboard socket to the trainer sockets indicated. Power connections are not shown but are made in the same manner, using jumpers. To enter a 1, the push-button is used to clock the circuit with the J input connected to +5 V dc and the K input connected to ground. For a 0, these connections are reversed. (The operation of the shift register is verified using the trainer before proceeding to the next step.)

The shift register can be modified to form a parallel up/down counter if the first flip-flop is wired to toggle each time it is clocked and the following flip-flops are made to toggle dependent on the Q or $\overline{Q}$ outputs of the preceding flip-flops. If the Q outputs are used, the count will be in ascending binary

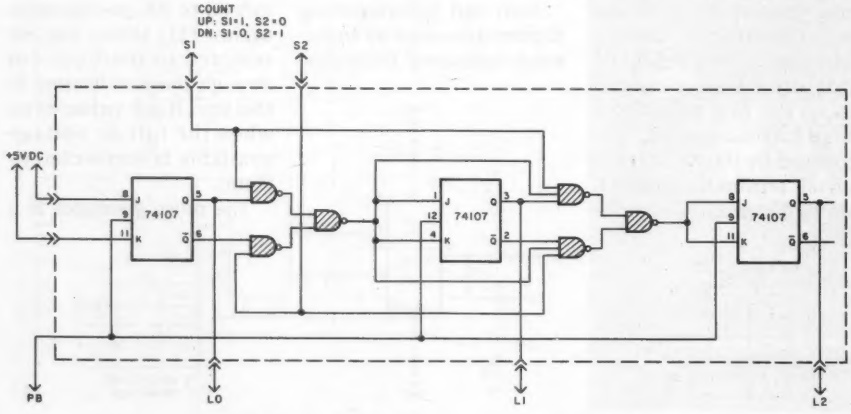


Fig. 8. Parallel up/down counter development.

Parts List

C1	Capacitor, electrolytic, 100 μF/35 V	$ .80
C3	Capacitor, .1 μF, 10%	.60
D1–D4	Diodes, 1N4001	.25
D5–D8	LEDs, T-1 size	.40
J1	Coaxial power jack	.40
J2–J6	Misc. jacks made from IC sockets	.50
R1–R4	Resistors, 1k, ¼W, 5%	.10
R5–R8	Resistors, 330 Ohm, ¼W, 5%	.10
R9, 10	Resistors, 1k, ¼ W, 5%	.10
R11	Potentiometer, 200k, ¼ W	1.25
R12	Resistor, 100 Ohm, ¼ W, 5%	.10
R13	Resistor, 1k, ¼ W, 5%	.10
R14, R15	Resistors, 330 Ohm, ¼ W, 5%	.10
S1–S4	Miniature SPDT toggle switches	1.75
S5	Miniature SPDT push-button switch	2.25
S6	Rotary Switch, 2-pole, 3-position	1.25
S7	Slide switch, DPDT	.50
U1	7805 Voltage regulator, +5 V, 1 Amp	1.60
U2	555 timer	1.00
U3, U4	Decade counter 7490	.65
U5	74107 dual J-K flip-flop	1.00
U6	7400 Quad NAND gate	.35
	Aluminum chassis, 5″×7″×1⅜″	5.00
	4 Rubber feet	.20
	Modular IC breadboard socket	11.95

Approximate unit prices as of January, 1984.

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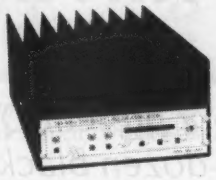

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sequence. If the Q outputs are used, the count will be in descending binary sequence.

This modification consists of wiring the J and K inputs of the first flip-flop to +5 V dc and installing the six gates shown shaded in Fig. 8. When S1 is at logic 1 and S2 at 0, the upper gates are enabled and the Q outputs are selected for up-count. When S1 is at 0 and S2 at 1, the lower gates are enabled and the $\overline{Q}$ outputs are selected for down-count. As in the case of the shift register, the operation of this circuit is verified before proceeding.

The main difference between the shift register and the counter is the source of the J and K inputs of each flip-flop. These two circuits can be combined if provision is made for selecting the proper signals as the J and K inputs for each operation. Similarly, the complement operation can easily be included at this step as it requires only that both inputs of all flip-flops be held high while the circuit is clocked. This switching can be accomplished by the addition of the 12 gates shown shaded in Fig. 9. As before, S1 and S2 control the count sequence. S0 selects shift register operation with a logic 1 or counter with a 0. A 0 on S3 overrides all other functions, forcing all flip-flop inputs high for the complement operation.

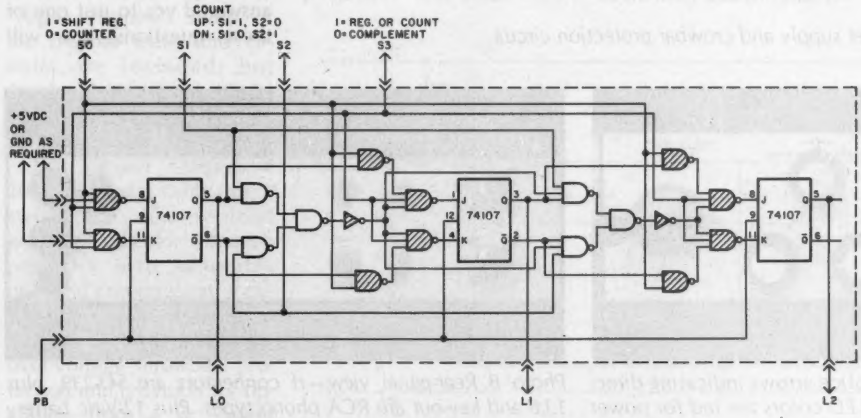


Fig. 9. Shift register and counter combined.

Though the circuit illustrated here has limited practical application, it serves to illustrate that the digital IC trainer is a convenient aid in the development of complex circuits. As the breadboard socket becomes crowded by the inclusion of more circuits, the space available can be extended simply by attaching another socket. These sockets provide for such expansion by means of interlocking grooves. The only limitation is the capacity of the power supply...and the size to which you want to build the working area.

I have found the digital IC trainer to be a valuable addition to my shop. It has proven to be a great help in testing components as well as in experimentation and circuit development. Why not build one for yourself and see if it doesn't make your digital experimentation less painful?■

Get Organized Today With Argo's Helper

If your present QRP station is comprised of a half-dozen black boxes interconnected with several cables, then this may be the construction project for you.

F. T. Marcellino W3BYM
13806 Parkland Drive
Rockville MD 20853

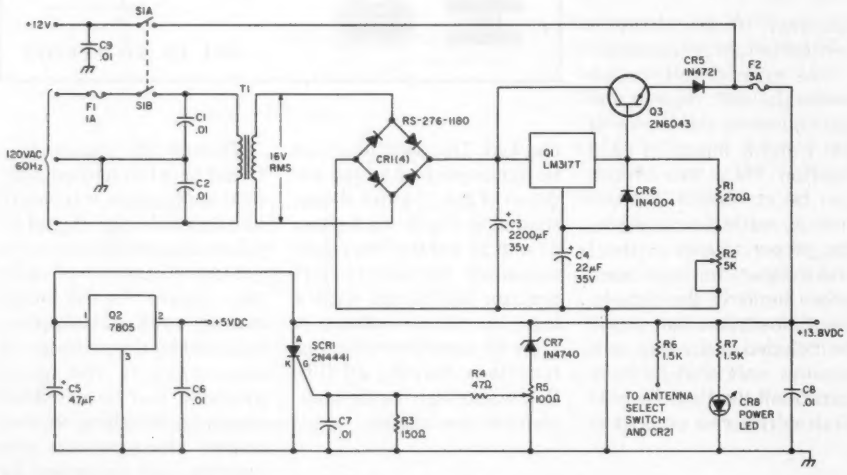


Fig. 1. Power supply and crowbar protection circuit.

Attention QRPers! How would you like an organized station? Would you prefer your favorite accessories packaged in one cabinet? Would you consider increasing the talk power of your SSB signal and having additional features for more operating enjoyment? If you answered yes to just one of these questions, you will

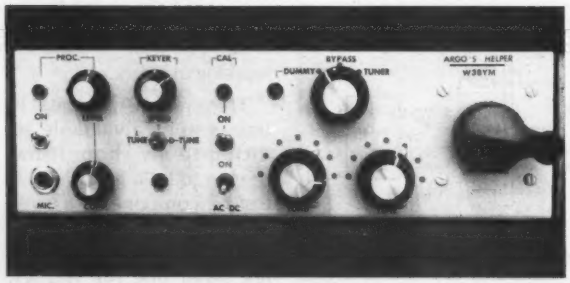


Photo A. Front-panel view—notice arrows indicating direction for tune and delay tune. LED colors are red for power and CAL, green for dummy load and processor.

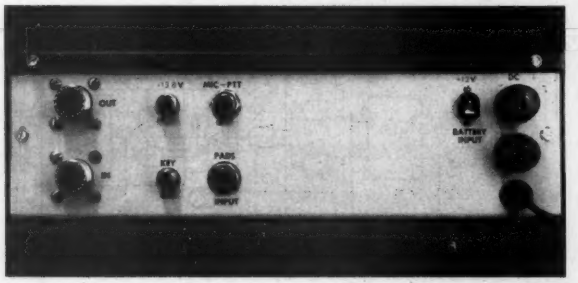


Photo B. Rear-panel view—rf connectors are SO-239, plus 13.8 and key-out are RCA phono types. Plus 12-V-dc battery input is a panel-mount coaxial power connector.

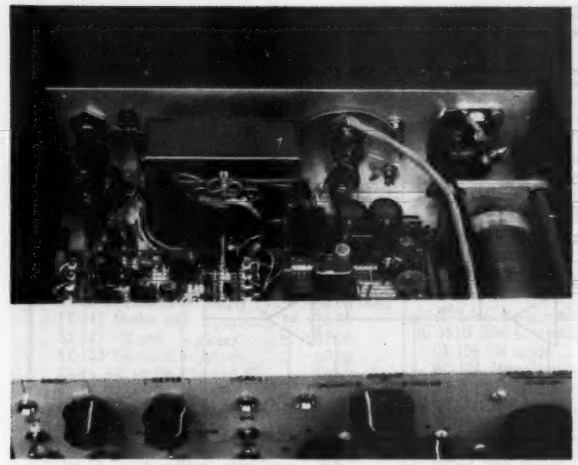


Photo C. Internal rear portion showing major power-supply components. Notice bypass capacitors and RFC1 choke placement.

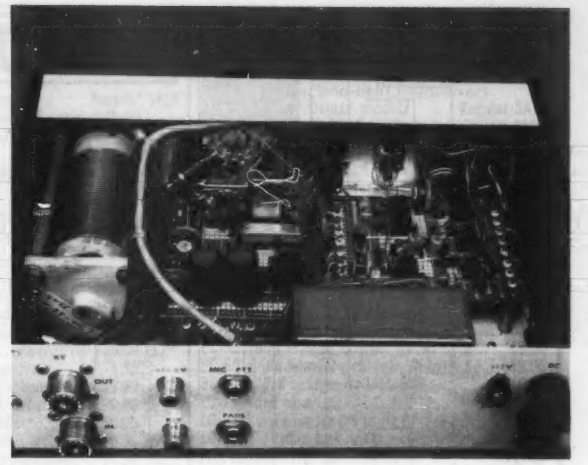


Photo D. Internal front portion showing board layouts and rotary inductor. Notice the RG-58/U routing.

find this article interesting reading. If you answered yes to more than one question, you should consider building a similar project.

This article describes a QRP station accessory that I built to complement my Argonaut 515 transceiver. For those who keep abreast of construction articles in this magazine, you might remember my first station organizer, the "Supernova," that was published in August, 1981.

Since that time I've enjoyed QRP operation a great deal and decided to expand my capability to include SSB operation. I traded my HW-8 for the Argonaut 515 and at that time began the design of the second organizer, which I named "Argo's Helper." Some of the original ideas and circuits are included, but Argo's Helper has several new ideas to provide increased pleasure.

This project features a 100-kHz crystal calibrator, a switchable dummy load with LED indicator, a speech processor with adjustable gain and compression, a delay-tune and full-tune function, an ac power supply with over-voltage crowbar protection and provision for operation from a dc power source, and finally, an antenna tuner using a continuously-variable rotary inductor.

The entire station organizer is neatly packaged into a Ten-Tec cabinet (model LW-10) measuring 10½" × 7" × 3¼". The front-panel switches, knobs, and LED assemblies were purchased from Radio Shack, except for the offset knob for the inductor, which I picked up at a flea market. A turns-counting dial was purposely omitted because of limited front-panel space and the need for only a few turns for most coupling situations.

The internal construction is shown in the photos. For ease of construction, two PC boards (RS 276-162) were used, incorporating point-to-point wire and solder construction. The power supply and crystal-oscillator circuitry are mounted on the center board, while the speech processor and keyer circuits occupy the remaining board.

The series-regulator output transistor is mounted near the back and below the power-supply board, directly on the chassis. The chassis provides an excellent heat sink when the transistor is mounted using a mica washer and thermal grease. The dc output from the regulator is controlled by a board-mounted trimpot, R1, which I preset to 13.8 V dc. The over-voltage crowbar circuit mounted on the power-supply board is preset to about 15.5 V dc using another board-mounted trimpot, R5.

Construction of the tuner isn't critical but requires special attention for mounting the variable capacitors, C38 and C39. These two capacitors must be isolated electrically from the front panel on both their rotors and stators. I accomplished this by using nylon screws with fiber washers threaded into the pre-tapped holes in the capacitor frames. Clearance between the capacitor frames and the bottom surface of the chassis was extremely tight in this installation, requiring a small piece of plastic sheet for complete isolation.

Most of the tuner wiring is on the switch wafer and the two capacitors. The rotary switch is another flea-market purchase which I chose

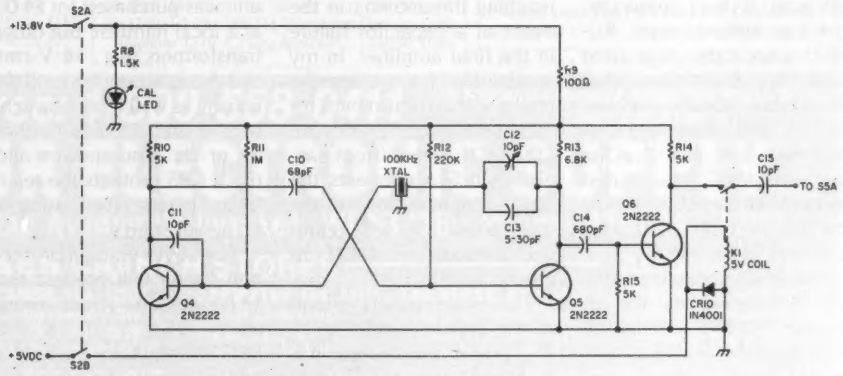


Fig. 2. Crystal calibrator circuit.

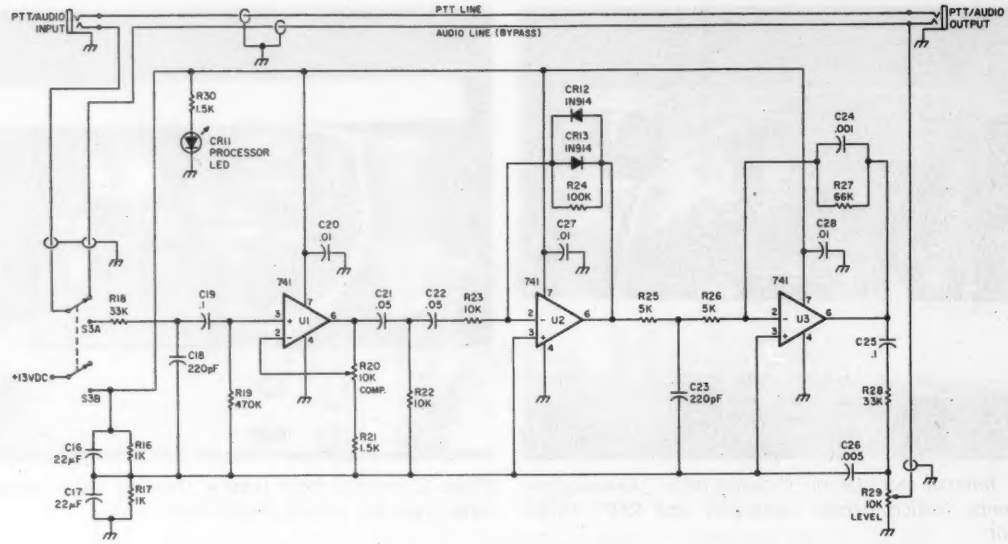


Fig. 3. Speech processor and bypass circuit.

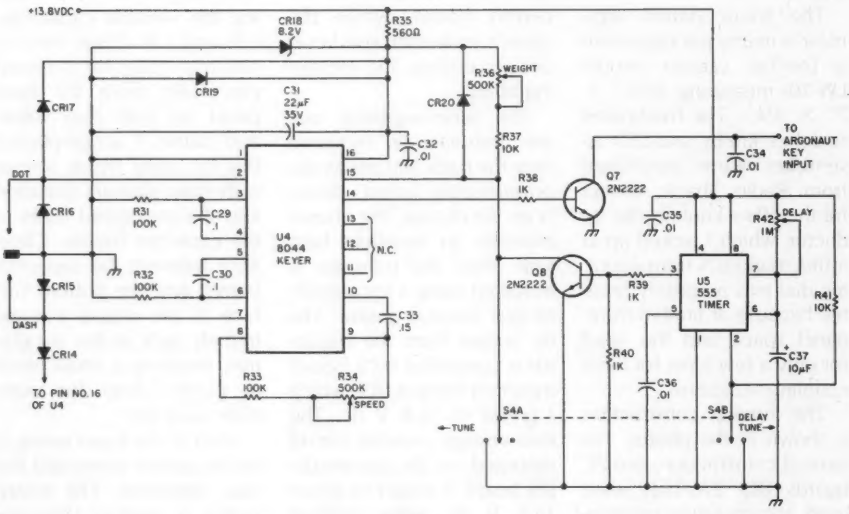


Fig. 4. Keyer and delay-tune circuit.

because it is a miniature, low-loss ceramic type. RG-58/U coax cable was used with the braid grounded from the SO-239 connectors to both wiper arms of switches S5A and B. One bus wire (AWG 14) was used to connect the top of inductor L1 to both capacitors C38 and C39.

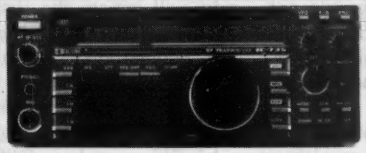
The RFC1 choke is mounted directly across the rf-output SO-239 connector. The purpose of this choke would normally be to prevent high voltage from reaching the antenna in the event of a capacitor failure in the final amplifier. In my application, I am using the choke as a dc return path for the dummy-load indicator, LED CR21. When front-panel switch S5A connects the 50-Ohm dummy load to the transceiver, S5B will return the cathode of CR21 to ground via RFC1.

The power-supply circuit is very conventional (Fig. 1). The power transformer has no brand name, but is rated for 16 V rms at 4 Amps. This unit was purchased for $4.00 at a local hamfest, but other transformers (e.g., 18 V rms at 2 Amps secondary) will do equally as well. Power switches S1A and B control either ac or dc input power and diode CR5 protects the regulator circuits when using a dc power source.

The over-voltage-protection circuit will prevent the 13.8-V-dc line from rising above 15.5 V dc if the LM317T regulator fails. If a failure occurs, the gate voltage of SCR1 will reach the trip point set by trimpot R5. This action forces SCR1 into conduction and switches the 13.8-V-dc line to near ground potential very quickly while simultaneously exceeding the limits of fuse F2. F2 will open circuit, thereby protecting the Argonaut and its "Helper" from harmful voltages.

The front-panel power LED and dummy-load LED have their current-limiting resistors, R6 and R7, mounted on the power-supply board. Notice the abundant use of .01-uF disc bypass capacitors. These are very cost-effective devices used throughout the station organizer to bypass any unwanted rf currents to ground.

Fig. 2 shows the 100-kHz crystal calibrator. This circuit uses a standard multivibrator circuit built with discrete parts. Care should be taken to follow the circuit very closely. The 10-pF capacitor, C11, is necessary to guarantee oscillator starting each time the power is applied via S2A and B. The two capacitors, C12 and C13, can be replaced with one larger variable capacitor if one is available. In my circuit, I soldered the case of the crystal to ground using a



HF Equipment	Regular	SALE
IC-735 HF transceiver/SW rcvr/mic	849.00	729.95
PS-55 External power supply	160.00	144.95
AT-150 Automatic antenna tuner	349.00	314.95
FL-32 500 Hz CW filter	59.50	
EX-243 Electronic keyer unit	50.00	
IC-745 9-band xcvr w/.1-30 MHz rcvr	999.00	769.95
PS-35 Internal power supply	160.00	144.95
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
FL-45 500 Hz CW filter (1st IF)	59.50	
FL-54 270 Hz CW filter (1st IF)	47.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-44A SSB filter (2nd IF)	159.00	144.95
HM-10 Scanning mobile microphone	39.50	
SM-6 Desk microphone	39.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	19.50	

IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	1089
PS-35 Internal power supply	160.00	144.95
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-33 AM filter	31.50	
FL-70 2.8 kHz wide SSB filter	46.50	
HM-12 Extra hand microphone	39.50	
SM-6 Desk microphone	39.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	
IC-720A 9-band xcvr • (CLOSEOUT) •	1349.00	699.95
PS-15 20A external power supply	149.00	134.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
BC-10A Memory back-up	8.50	
SM-5 8-pin electret desk mic	39.00	
MB-5 Mobile mount	19.50	

Other Accessories:	Regular	SALE
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CF-1 Cooling fan for PS-15	45.00	
EX-144 Adaptor for CF-1/PS-15	6.50	
PS-30 Systems p/s w/cord, 6-pin plug	259.95	234.95
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PP-1 Speaker/patch (specify radio)	139.00	129.95
SM-8 Desk mic - two cables, Scan	69.95	
SM-10 Compressor/graph EQ, 8 pin mic	119.00	
AT-100 100W 8-band auto. antenna tuner	349.00	314.95
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AH-1 5-band mobile antenna w/tuner	289.00	259.95

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IC-490A 10W 430-440 SSB/FM/CW	649.00	579.95

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SP-10 Slim-line external speaker	29.95	
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AH-32 2m/440 Dual Band antenna	32.95	
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IC-1271A 10W 1.2 GHz SSB/CW Base	999.00	889.95
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PS-25 Internal power supply	99.00	89.95
EX-310 Voice synthesizer	39.95	
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IC-120 1W 1.2 GHz FM Mobile	499.00	449.95
ML-12 1.2 GHz 10W amplifier	339.00	299.95

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BC-35 Drop in desk charger for all batteries	69.00
BC-60 6-position gang charger, all batts	SALE 359.95
BC-16U Wall charger for BP7/BP8	10.00
LC-11 Vinyl case	17.95
LC-14 Vinyl case for DIx using BP-7/8	17.95
LC-02AT Leather case for DIx models w/BP-7/8	39.95

Accessories for both models	Regular
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BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
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CA-2 Telescoping 2m antenna	10.00
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FL-63 250 Hz CW filter (1st IF)	48.50	
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EX-257 FM unit	38.00	
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short piece of bus wire for added stability. The calibrator will provide an S7 to S9 signal from 100 kHz to 30 MHz, and to ensure this high output, capacitor C14 must be connected to the collector of Q5. The circuit will work if C14 is connected to Q4's collector, but the output is greatly attenuated at high frequencies. Relay K1 was included to protect the output buffer transistor Q6 from rf overload when the Argonaut is transmitting.

Fig. 3 shows the speech processor. This circuit uses a single supply with on-board filtered voltage division. The following brief description tells how the circuit works. The first stage is a common audio amplifier with its gain controlled by potentiometer R20. The second op amp is a audio amplifier with diodes in the feedback loop. If U1's output remains below ±0.6 V dc, it will behave like an amplifier. When audio peaks exceed 0.6 V dc, CR12 and CR13 will conduct and limit the gain of U2. This action keeps the audio level constant on U2's output. U3 is a bandpass filter that removes unwanted harmonics and R29 controls output level.

I built my processor using three 741 op amps in 8-pin packages. The reason for the three-chip design instead of one quad is the ease of component layout. You can use the single quad, but placement of the many components around it presents quite a challenge.

Fig. 4 shows the conventional Curtis Keyer circuit which I used in the first organizer, and because of its trouble-free operation, I decided to use it in this project. The output keying circuit is slightly different, consisting of R38, C34, and Q7. The Argonaut key input presents about a 2-V-dc positive signal to ground. This signal, and hence the keying function, is easily controlled by driving the NPN transistor from the 8044 output pin.

I've added a new feature for holding the key line down for a preset interval; I call it "delay tune." This has been very useful during tune-up periods, allowing both hands to be free to adjust the tuner's inductor and capacitors. Using trimpot R42, I've set the delay tune for 6 seconds, which seems to be a good time interval for this function. The 1-M trimpot will allow about a 10-second maximum delay. Switch S4B (spring-loaded side) will initiate the timing cycle of U5. I also included the conventional full-tune function, which holds the key line down all the time with S4A (standard toggle side). This switch, a DPDT, spring-loaded, one side only, is another special item not readily available, which I found at a flea market for $2.00.

Parts List

C1, 2, 6, 7, 8, 9, 20, 27, 28, 32, 34, 35, 36	.01 uF, 50 V
C3	2200 uF, 35 V
C4, 16, 17, 31	22 uF, 35 V
C5	47 uF, 35 V
C10	68 pF, 50 V
C11, 12, 15	10 pF, 50 V
C13	5–30-pF trimmer
C14	680 pF, 50 V
C18, 23	220 pF, 50 V
C19, 25, 29, 30	.1 uF, 50 V
C21, 22	.05 uF, 50 V
C24	.001 uF, 50 V
C26	.005 uF, 50 V
C33	.15 uF, 50 V
C37	10 uF, 50 V
C38, 39	400 pF, variable
CR1, 2, 3, 4	RS 276-1180
CR6, 10	1N4004
CR5	1N4720
CR7	1N4740
CR8, 9, 11, 21	LEDs
CR12, 13, 14, 15, 16, 17, 19, 20	1N914
CR18	8.2-V zener
F1	3 AG, 1 A
F2	3 AG, 3 A
K1	SPDT, 5-V relay
L1	33-uH inductor
Q1	LM317T
Q2	7850 5-V regulator
Q3	2N6043
Q4, 5, 6, 7, 8	2N2222
R1	270 Ohms
R3	150 Ohms
R2	5k trimpot
R4	47 Ohms
R6, 7, 8, 21, 30	1.5k Ohms
R10, 14, 15, 25, 26	5.1k Ohms
R5	100-Ohm trimpot
R9	100 Ohms
R11	1 M
R12	220k Ohms
R13	6.8k Ohms
R16, 17, 38, 39, 40	1k Ohms
R18, 28	33k Ohms
R19	470k Ohms
R20, 22, 23, 29, 37, 41	10k Ohms
R24, 31, 32, 33	100k Ohms
R27	66k Ohms
R35	560k Ohms
R34, 36	500k pot
R42	1-M trimmer
R43	100 Ohms, 2 Watts
RFC1	2.5-uH choke
S1, 2, 3	DPDT toggle
S4	DPDT spring load
S5	DP3T ceramic rotary
SCR1	2N4441
T1	16 V, 4 A
U1, 2, 3	741 op amp
U4	8044 keyer
U5	555 timer
X1	100-kHz crystal

Fig. 5 shows the antenna tuner with switchable dummy load and indicator. The load was fabricated using two 100-Ohm, 2-Watt carbon resistors connected in parallel. The tuner circuit is a basic T-match circuit and allows me to use practically any antenna. I've included a tuner bypass feature which effectively removes the tuner when a resonate antenna is available for the operating frequency. The two variable capacitors, C38 and C39, are single gang types, having about 400 pF each. Note the connections from the crystal-calibrator output and from the 1.5k-Ohm R6 for the indicator LED.

Calibration and setup of the various trimpots and capacitors is not difficult, but requires a little patience. Adjustment of the main dc voltage is done by monitoring the voltage between the cathode of isolation diode CR5 and chassis ground. Trimpot R2 will set this voltage to any desired value between 12 and 15 V dc. I set my power supply to 13.8 V dc to be in compliance with Ten-Tec's specifications.

The over-voltage crowbar circuit will clamp the main dc voltage to ground in the event of an LM317T failure. Fuse F2 should be temporarily replaced with a 100-Ohm, 2-Watt resistor for this adjustment. Starting with the arm of R5 adjusted to the ground side, slowly rotate the trimpot until the main dc voltage drops to zero. When the trip point is located, rotate the trimpot back toward the ground side about two turns to reach a trip level of 15.5 V dc. In my

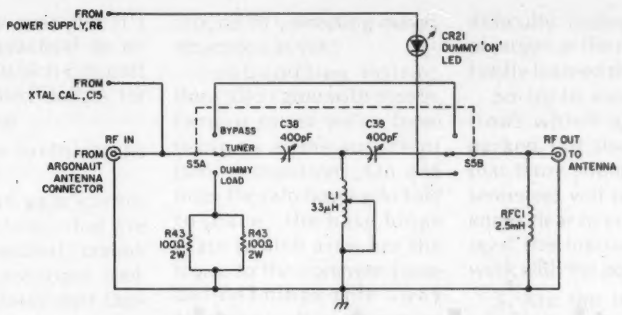

Fig. 5. Antenna tuner, bypass, and dummy-load circuit.

installation, a 10-turn trimpot offered increased settability.

The crystal calibrator was calibrated using my R-1000 receiver, but a frequency counter would be a better standard if available. Set the receiver to a multiple of 100 kHz near 30 MHz and couple the output of C15 directly to the receiver's input. At this frequency and with the same component values, capacitor C13 will vary the output a total of 6 kHz. Zero-beating WWV at 10 MHz is another good method using a suitable receiver. Obviously, the higher the test frequency used, the greater the accuracy of the calibration.

The keying-circuit adjustments are mostly self explanatory. Speed control R34 can be set easily for any wpm between 8 and 50. I set R36, the weight control, for 50/50 operation with a midscale setting. Other weight settings can be determined by monitoring the transmitted signal with an independent receiver.

Operation of Argo's Helper combined with the Argonaut 515, whether in my shack or using a dc power source in the wilderness, has been very enjoyable. The unit is more versatile than the first organizer and could be modified for operation with other QRP rigs. The delay-tune function is used almost exclusively and really helps by freeing my other hand for tuner adjustments. The speech processor gives the 5-Watt signal additional punch and makes a good conversation topic when switched in and out without informing the other operator. The tuner allows better matching on all bands while using a wider variety of antennas.

I hope some of you QRPers will find my ideas useful, or better yet, are motivated to construct a similar unit. If your present QRP station is comprised of a half-dozen black boxes interconnected wth several cables, then this may be the project for you. I will be glad to answer any questions if additional clarification is needed or a circuit problem is encountered. ■

References

1. 8044 Keyer Data Sheet, Curtis Electro Devices, Inc., revised Februrary 23, 1979.
2. "The Supernova Station Organizer," *73*, August, 1981.

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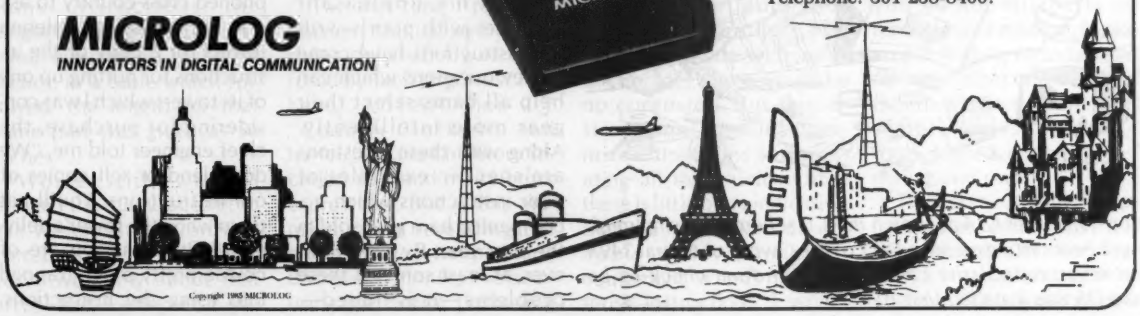

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Recently I bought an antenna system consisting of the usual four units — tower, antenna, rotor, and rotor control. All the gear is nationally-advertised, widely-used, and highly-regarded by hams throughout the country.

But *every unit* came with printed instructions which had serious errors, omissions, confusions, even contradictions. Indeed, at least one error was an absolute farce.

How serious is the problem of ham gear supplied with instructions which are inaccurate, inadequate, inferior, incomplete, or just plan bungled? Apparently no one knows. At least, a diligent search of ham magazines, handbooks, guides, instructions, and other such publications found no helpful reports, tips, or solutions.

Step 19. Solder C14 as shown in PCB schematic using minimum heat setting on page D-11 of the Owner's Manual 349X not reversing polarity carefully. When done check to be sure D5 was installed first.

Casual on-the-air comments by hams in Washington, Ohio, Florida, Nebraska, California, and other states, however, confirm that poor instructions are indeed a widespread concern.

Ham talk also seems to document that most of us select our gear without giving much thought — perhaps no thought at all — to the effectiveness of the printed instructions which come with our purchases. Yet it is obvious that good instructions can make assembling and operating a unit easy, fast, efficient, and safe — a pleasure to own.

On the other hand, poor instructions can cause delays, waste efforts, spark frustrations, increase costs, produce errors, ruin equipment, and create dangers. In extreme cases, injuries can result.

From my unpleasant struggles with poorly-written instructions have come 10 key questions which can help all hams select their gear more intelligently. Along with these questions are specific examples of poor instructions which accompanied ham gear sold in the past year. By now, however, at least some of these problems — it is hoped — may have been corrected. Therefore, the names of the offending companies are not mentioned.

1. *Can you read the instructions before you buy the gear?*

At any of the current 64 Heathkit® stores throughout the nation you can read the instruction manuals for any of the company's more than 50 pieces of ham equipment, no obligation to buy and no cost, of course. And as the manager of the Cupertino, California, store told me, "Take all the time you need."

Or you can buy a copy of any of Heath's instruction manuals. The cost (a few dollars) is but a modest investment to help you be sure the instructions are effective and that you'll be able to follow them.

On the other hand, when I phoned cross-country to ask a manufacturer of antenna towers for a copy of the instructions for putting up one of its towers which I was considering for purchase, the chief engineer told me, "We don't lend or sell copies of our instructions. You'll get them when the tower's delivered." By then, you are of course pretty much trapped into using the instructions,

bad as they may be; it's clearly not practical to return a tower which can cost several hundred dollars for shipping alone.

2. *Do the instructions make sense?*

Some ham gear comes with instructions that are clearly impractical, unrealistic, even downright foolish. An overstatement? Consider this example.

This farce was included in the 15-page *Instructions for Installation and Operation* for a nationally advertised antenna tower. The purchaser was instructed to lay a concrete foundation on which to raise the tower—a foundation 24 inches square and ten inches deep. That would be a block weighing some 500 pounds.

A few pages later those same instructions told the purchaser that *after* the 480-pound tower was in place on top of that 500-pound foundation: *If tower is out of plumb, shift the concrete foundation block to bring it into vertical alignment, and then backfill firmly around the foundation.*

Can you imagine the struggle to try to prop up one corner of that 25-foot-high, 980-pound mass, or lowering another corner, to get the entire installation sticking straight up in the air?

3. *Are the instructions free of contradictions?*

Instructions which came with one "world famous" beam antenna warned, "Correct assembly and dimensional adjustments are very important to successful operation." Later in those same instructions, the length of one part of an element was stated to be 51 inches; in a table which followed, the length for that same part was given as 50 inches.

Worse still, when I phoned the manufacturer to ask which dimension was correct, I was told, "Ohhh yes...we know about that error. But we haven't got around to correcting our instructions as yet."

Contradicting instructions also came with that infamous tower we've been using as a fine source of poor instructions. On one page the purchaser was told to place "the base hinge plate [which attaches the tower to the concrete foundation] hinge side away from the wall as shown on Detail FB." That "detail," a drawing on the next page of the instructions, showed the hinge reversed, its side *toward* the wall.

Later, those same instructions introduced two contradictions with one sentence. It said the "pulley and safety rest have been inverted so that its [sic] arm will not project outward" during shipping, and therefore "must be reversed as explained below." The instructions "below" never mentioned reversing the pulley; however, that made sense because the pulley arrived not reversed, as stated, but welded firmly in position. And the safety rest, which the instructions said to "reinstall," arrived not installed in reverse, as claimed, but came uninstalled, in parts, unassembled.

4. *Are the instructions free of unnecessary jargon?*

The problem in trying to establish guides for this criterion is that language that is jargon to one person may be perfectly understandable to someone else. Furthermore, the more you read and use jargon, the quicker it may become understandable and therefore acceptable.

The first time I read the *Owner's Manual* for my new rotor control, I was confused by such jargon as "Rec Last," "SCAN then 7," "Counter Clockwise end travel," "access memory location #1," and many other expressions. But at this moment, after rereading the manual many times during the several months I've been using the control, I'm having difficulty finding examples of jargon in the manual; I've finally learned the language.

So try to avoid instructions which are jargon-packed, but also remember that those strange-sounding sentences will probably become clear to you as you reread the instructions and work with the equipment.

5. *Are the instructions specific?*

The instructions for the winch which came with my antenna tower included this great line: *If brake disc mechanism operates intermittently or erratically, brake disc inspection should be accomplished.*

Ignoring that twisted syntax, I searched without success for instructions on how that inspection should be "accomplished." Should I dismantle the winch? Should I look for loose parts, dangling cable, or whatever? *Well,* I thought, *forget the inspection—how do I fix the winch when it operates "intermittently or erratically"?*

No instructions on that, either.

Other nonspecific instructions you should watch out for include such lines as: "Adjust as may be needed." —"Place in a suitable location."—"Tighten as required."

6. *Are the instructions clear?*

The 30-page booklet which came with a nationally-advertised rotor control unit includes instructions not only for the model I bought but for two similar but more sophisticated models.

If the instructions for those other models had been in separate sections of the booklet, there would be no confusion. But this instructional booklet intermixes directions for operating all three units. Often there is little or no indication that the instructions do not apply to my particular equipment. When I first read those instructions, I would suddenly find myself trying to learn how to operate features that were not on my model. Confusing, indeed.

7. *Are the instructions in a logical sequence?*

I haven't found any manufacturer's instructions which say something such as, "But before doing that last step, you must..." But some instructions come pretty close to such confusion.

Page 11 of instructions for assembling a beam antenna said to install screws, lockwashers, and nuts on some straps. The instructions didn't state on which side the screws should be placed, yet in later steps the placement of that hardware became critical.

A very serious injury was almost caused by what was left out of another instruction. It said to "mount the balun clip to the circular boss." It did not include a warning that during the mounting the clip might become loose and fly off at a high speed. It did fly off, hit me in the forehead, broke the skin, and caused bleeding; if it had hit me just one inch lower, I would probably now be blind in one eye.

On the other hand, if you want to read instructions which are a model of logical sequencing—indeed, a model of the ideal instructions on almost every criterion—look at a Heathkit manual. Each of the more than 25 Heath manuals I've used starts with an "Introduction," a brief overview of the purpose, use, and features of the unit. Next are tips for "Unpacking," to make sure you do not mix parts intended for one board, for example, with those to be used on some other board. Heath manuals also present "Assembly Notes," hints on tools, identifying parts, soldering, and such.

Then come detailed step-by-step assembly instructions presented in a very logical, clear-cut sequence. There's a check-off system

Judging Instructions for Ham Gear
Check-Off List

When evaluating the instructions which accompany ham gear you are thinking about buying, check off each item below to help you decide if the instructions are effective.

_____ 1. Can you read the instructions before you buy the gear?
_____ 2. Do the instructions make sense?
_____ 3. Are the instructions free of contradictions?
_____ 4. Are the instructions free of unnecessary jargon?
_____ 5. Are the instructions specific?
_____ 6. Are the instructions clear?
_____ 7. Are the instructions in a logical sequence?
_____ 8. Are the instructions free of any "surprise instructions" which may come after you've ordered the gear?
_____ 9. Do the instructions include a phone number you can call for help—ideally an 800 (toll-free) number?
_____ 10. Are you confident the instructions tell you everything you need to know?

to help ensure that you install each part correctly. There are numerous drawings, enlarged drawings of small units or more difficult steps, and photos. Many parts are identified four ways: by Heath part number, circuit component number, electronic values, and by a description of markings.

Final sections of Heathkit manuals present operating guides, procedures "In Case of Difficulty," specifications, circuit description, schematic, and other details. Unlike some other instructions, you'll rarely need to search back and forth through Heathkit manuals for an out-of-sequence step.

8. *Are the instructions free of any "surprise instructions" which may come after you've ordered the gear?*

"Surprise instructions" are such unrevealed details as additional equipment that may be needed, restrictions on use, limitations on locations, unexpected safety recommendations, unmentioned delivery problems, and such.

About a week after I'd ordered that infamous tower—but *before* the tower was delivered—I received in the mail three additional instructions from the manufacturer—details I'd not been told about before ordering the tower.

One instruction was printed in brilliant red on bright yellow paper. Across the top of the page, in letters a half-inch high, was the word "WARNING!" Then came these statements (among others):

- Be sure to check your shipment carefully before acceptance.
- All shipments are made at the risk of the purchaser and (name of the tower) will not be responsible for shortage, loss, or damage occurring in transit.

As fate would have it, the antenna was delivered during a heavy rainstorm. But even without the rain, you can imagine the problem of trying to get a big and busy truck driver to wait as you unpack, count, and inspect some two dozen parts ranging from 20-foot tower sections to 1¼" cotter pins.

A second page of surprise instructions came only after the tower was ordered. It was titled "Duty of consignees to accept freight even though damaged." It presented four long paragraphs of quasi-legal statements claiming that if what I'd ordered was delivered in a damaged condition, I had to accept it no matter what! The final point in those instructions: If the gear arrives damaged, "it is decidedly to [your] advantage to either repair [it] and file claim for cost," or "to sell the merchandise 'as is'" and then "file claim for the loss suffered."

Sure enough, the gear arrived damaged. I phoned the manufacturer and firmly pointed out that while such a provision might be enforceable in the state from which the tower was sent, it probably could not be enforced under the laws of the state in which it was delivered. The manufacturer backed down immediately and sent replacement parts.

Another example of surprise instructions came with a beam antenna. It was not until page 16 of the instructions—just as the antenna was about ready to be raised—that I was told I'd need a 3- or 4-foot mast ("not supplied") to use in finding the "balance point" of the antenna.

While many hams have hefty stocks of such supplies stored at their QTH, I don't. The result can be an unexpected dash to the hardware store, inconveniently and unfairly delaying friends who have gathered to help raise the antenna. A minor point? Perhaps. But why shouldn't all instructions present—right at the start—a list of everything you'll need to complete the project?

9. *Do the instructions include a phone number—ideally an 800 (toll-free) number—you can call for help?*

include this detail. Heathkit instructions always include phone numbers for technical assistance, ordering replacement parts, and such, although they are not toll-free. If the instructions you're evaluating don't give a phone number, there are three steps to getting information you need.

First, of course, phone the store from which you bought the unit. If the staff there can't give you the information you need, then phone the corporate headquarters of the manufacturer of the gear. Ask for "customer service" or "the expert" on the gear which has the problem instructions.

If you still don't get the answers you need, don't hesitate to phone the president of the company. It's been my experience that a surprising number of top executives are readily available and will have the information you need sent to you quickly. Indeed, I find that the president's personal secretary (but often no one less) also will get you answers promptly.

The doubter asks, "What about the extra cost for the phone calls?" Even several cross-country calls cost but a tiny percent of the expenditure you are considering investing in the gear. Besides, you may be lucky: When you call, the key person may not be in, so you can leave a message asking him or her to return the call to you; then the cost is on the company's bill. Presidents, in particular, I notice, generally return calls promptly.

10. *Are you confident the instructions tell you everything you need to know?*

This question is obviously difficult to answer—perhaps impossible—until you are actually trying to follow a set of instructions. Still, there are a few precautions you can take.

First, you can try to find some other ham who has used the gear and ask him or her how complete the instructions are. You might have used another set of instructions, for some other gear, put out by the same manufacturer. Check these; the chances are that if a company has prepared clear-cut, specific, valuable instructions for one of its units, then instructions for

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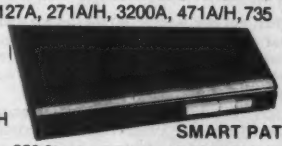

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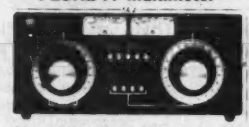

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its other gear are likely to be effective, too.

Another possibility: Compare the instructions with those prepared by another company.

As a last resort, you might ask a salesperson or a manufacturer's representative if the instructions include all the information you'll need. It's not likely they'll tell you about any shortcomings, but if they say, "Yes, the instructions are complete," and you find later that they are not, you may have a bit more clout in trying to get the additional information you need.

In sum, as you consider the purchase of any piece of ham gear, you should be able to answer "yes" to all, or substantially all, of the above questions to help ensure that the instructions for the equipment are effective. If you must answer "no" to more than a few of those questions, you might well shop around for some other unit which may have better instructions.

Realistically, many of us don't want to reject buying a unit just because the instructions are poor. So if you find good gear with poor instructions, you should certainly contact the manufacturer to try to get clarifications.

Still, one key problem remains: Many instructional guides seem clear-cut and easy-to-follow when you're considering the purchase, but later, when you're assembling, installing, or operating the gear, you may face doubts, questions, and confusion.

Unfortunately, shortcomings in instructions for ham gear will very likely continue until hams themselves unite to tell manufacturers that their instructional manuals must follow specific criteria. Until then, we'll have to continue to depend on the ancient Latin proverb, *Caveat emptor*—Let the buyer beware.■

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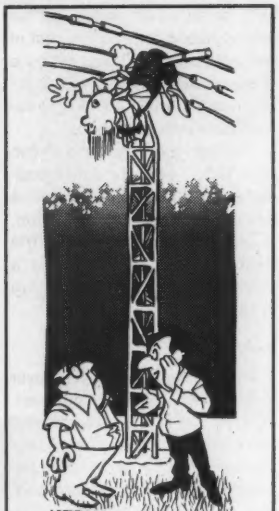
HAVE AKAI 4000DB REEL RECORDER. Will trade for two meter handheld or mobile. Bill Parrott, 733 East Towne Street, Glendive MT 59330; BNB418

ANTIQUE RADIO CLASSIFIED, the national publications for buyers and sellers of old radios and related items. $1.50 sample. 9511-23 Sunrise Blvd., Cleveland OH 44133. BNB419



I'd help Ralph get down but he's giving me a 1:1 swr!

REVIEW

KANSAS CITY KEYER

Dayton. Lance Johnson had a booth there, on a corner I think it was, and he was hawking a keyer, pretentiously claiming that with it, "CW would never be the same again." I can remember seeing a group of ogle-eyed contest types huddled around the display, listening to the code coming out of a tan box, their fingers twitching and their smiles broadening as Lance led them through his spiel.

The next time I thought of Lance Johnson's Kansas City Keyer was a few hours after a grueling ARRL Sweepstakes. It was grueling because I had spent twenty-four hours flailing away at my ten-year-old Accu Keyer; by hour six, each dit and dah required a supreme effort of will! It was in that quiet, ringing-head time after the contest that I remembered those twitching fingers and broad smiles and swore to myself that, come next test, I, too, would have a reason to smile—my Keyer arrived a week later.

Outside

The Kansas City Keyer comes in an attractive two-tone tan box which is about four and a half inches wide and seven inches deep. There are two LEDs, a green one for power and a red one marked "Status," which monitors the machine's reaction to what you are trying to do. To the right of the LEDs is a rotary pot that serves both as an on-off switch and an analog speed control. The rest of the front panel is taken up by a sixteen-button touchpad (0–9, A–D, *, and #) which you use to access the Keyer's functions.

The rear panel is home to two RCA jacks, used for either positive or negative keying voltage, a momentary-contact Reset button, a DIN jack for connecting the Keyer to your paddles, and a miniature phone jack for power (8 to 18 volts dc).

Inside

The true beauty of the KC Keyer is evident when you pop the cover. What you get in there is a powerful microprocessor dedicated to one job—managing your CW. The micro is a Rockwell 6502, a very popular and flexible chip found in many single-board computers (including the successful Apple II). Three chips are used in supporting roles: a 6522 Peripheral Interface Adapter, a 4K EPROM for program storage, and a 6116 2K SRAM for on-line memory. A handful of discrete components and SSI chips completes the hardware. The PC board is plated, double-sided, and obviously laid out by a professional.

Is there any advantage to using a general-purpose microprocessor for this sort of job instead of gates and clocks? Yes! Two advantages, in fact. The first is a reduced parts count—all of the gates and timers found in the last generation's keyers can be implemented in software. Of course, the program to do this may be quite long, but memory is so cheap today that program size can be discounted as long as the coding is efficient.

The second advantage is that a keyer in software can do anything that you want it to! Want automatic serial numbers? Fine, just write a few program lines. Need translation from Morse to International code? No problem, just add a lookup table. You get the idea. An additional plus is that upgrades are as easy as swapping a single EPROM. Power On!

Now we know what the KC Keyer looks like and what's inside it, but what can it do? When the power is turned on, the Keyer will be in its default configuration: speed at about 15 wpm, standard weighting, and automatic character spacing. The fourteen message buffers will be empty and the automatic serial number will be set to zero.

Programming is accomplished via the sixteen-button keypad. Each pushbotton has an assigned function which is assessed by pressing the * key. For example, pressing the sequence * Speed 2 5 will set the speed to 25 wpm. Speed is above the 2 on the keypad. A short beep is output through the internal speaker to confirm each keypress.

One small gripe about the speaker: There is no provision to disable the sidetone from the keypad. The beep is handy to have during the programming steps, but after about ten minutes of CW it becomes annoying. I ended up permanently disabling the sidetone by clipping the wire off the speaker. It would have been better, I think, to have used the rotary pot as a volume control rather than an analog speed control.

The Buffers

What really sets the Kansas City Keyer apart from other memory keyers on the market is the way the message buffers are set up. There are fourteen of them, 0-9 and A-D, and you can partition the 1500-character memory among the buffers any way you like. Text is entered by sending CW to the keyer after specifying which buffer is to hold the information. An "editor" of sorts is available in this mode; if you make a mistake, a string of eight dits will erase the current word and play back the word before it. Perfect word spacing is as simple as watching the red Status LED: At the end of each word, wait for the light to flash before entering the next code group.

Now for the really *good* stuff! You can at any time during text entry add a Wait command. When the command is encountered during transmission, the keyer will stop sending until a character or word is sent manually from the paddle. Say you have buffer A configured like this: TEST DE KW1O (WAIT) TU 5NN NH K. When message is selected, the Keyer will send TEST DE KW1O and stop. Now send the call of the responding station on your paddle: KM1C. After the C, the KC Keyer will continue with the message in buffer A: TU 5NN NH K.

You also can chain buffers together. Let's put TEST DE KW1O (WAIT) (B) in buffer A and TU 5NN NH K (WAIT) (A) in buffer B. Selecting message A will put the Keyer into a loop of calls and answers; if no one responds to your CQ, just select A again.

Automatic serial numbers are available, too. Add a pound sign (#) to your message for this option. I use one buffer for answering the inevitable requests for repeat—it DECrements the serial number and sends the exchange again. The number can be set at any time directly from the keyboard, and pressing the pound sign by itself will cause the Keyer to send the current serial number (be aware that doing this will also increment the number).

Remote Buttons

Any one of the features I've mentioned so far would have convinced me that the KC Keyer was in a class by itself, but Lance Johnson was on a roll! They decided that it would be neat if four of the message buffers were available remotely. What they designed was a little bracket made to attach to a Bencher paddle that brings out buttons A, B, C, and D. (I also tried it out on a set of Nye paddles—it fit without modification.)

This means that you can program buffers A-D with the appropriate information and operate an entire contest by pushing little buttons on your paddles! I do this with my left hand; my right hand is free to log and dupe. There's plenty of time for paperwork as the Keyer is busy sending the exchange.

The Keyer has a provision for battery backup. At first I thought that was odd, but I soon found it indispensable. I happened to have a couple of students who were learning Morse code. It was very easy for me to rattle off ten or fifteen minute's worth of practice into a buffer at 30 wpm at home, then take the Keyer to class and play back the material at 5 wpm. The Rate function let me set the character speed at 13 wpm, a method used by most instructors.

Last Words

Obviously, I like the Kansas City Keyer. I think you will, too. It is expensive—about $200—but what you get is a flexible CW computer that does things you can only dream about with your present machine. The manual is *very* good, and a newsletter comes out now and then which features programming tips and modifications.

If you are *serious* about CW, get in touch with *Lance Johnson Engineering, PO Box 7363, Kansas City MO 64116.*

Perry Donham KW1O
Rindge NH

ISOTRON SOLUTION FOR THE 160-METER BAND

Since the opening of the 160-meter band to amateur use, the 1.8-band-selector position on my FT-102 has been gathering dust. Like a number of hams, I simply do not have space to put up a 252-foot-plus wire antenna for 160 meters. Even if space was available I doubt if I would consider a wire antenna because of the difficulty I had in getting permission to put up my 5-band vertical at my apartment. It would be nice if there was a zero-space antenna for the 160-meter band!

Baltimore, Maryland, is approximately 500 miles from my QTH, and my contact with WB3GBF on 40 meters opened my eyes to the signal power of the Bilal Isotron antenna. My RST using a 5-band

vertical was 5–9 while WB3GBF's RST, using an Isotron 40-meter antenna, was 5–20 dB over 9. And to top this, he was using it inside his apartment.

As an ARRL Assistant Technical coordinator for North Carolina, N4BTK asked me to help him with his 20-meter-antenna problems in a local Senior Citizen retirement apartment complex. John lives on the 12th floor and had been using a coil-loaded window antenna but for some reason, 20 meters, even at the altitude of a 12-story building, was very weak. I suggested an Isotron 20-meter antenna as a better solution since the management would not permit a vertical or beam to be mounted on the roof. John's Isotron 40 was mounted 3 feet from the apartment's windowsill on an offset 1"-mast section. By comparison, it out-performs my 5-band vertical on 20 meters.

Impressed with the two-band performance of the Isotron antennas, I contacted Ralph Bilal WD0EJA about his 160-meter antenna and proposed that I work with it to obtain details for an article. My thought was that perhaps only an Isotron could give me 160-meter operation in my apartment complex, and this was an opportunity for me to see what it could do.

The Isotron antennas come in a kit form that can be fully assembled in less than an hour using only a screwdriver and 7/16" socket wrench (Photo A). They are definitely unique in that no frequency model occupies more than an area of 1.5' x 2' x 2.5', and most frequencies even less. Technically speaking, they defy the accepted antenna theorem of voltage and current distribution on a dipole antenna. One cannot help being impressed when seeing an Isotron in operation.

Assembly begins by attaching a formed aluminum plate to the insulated top support member. In my assembly of the 160-meter antenna, I first installed the mast clamp, U bolts in the end of the insulated bar and attached it to a mast section. This method supports the insulated bar while you attach the formed metal plates.

I followed the same method to mount the square metal lower support section to the mast for attaching the lower formed metal plate. Since the top and bottom plates are aluminum and will quickly oxidize, I spread a thin film of No-Ox over the surfaces that would overlap when bolted to the support bar.

No-Ox is a common non-oxidizing compound used to prevent aluminum oxidization of electrical wiring and is usually available at most electrical supply houses. After attaching the top and bottom formed plates, my antenna looked like bird wings, one above the other (Photo B).

The rather large antenna coil is attached between the top and bottom support bars by adjustable bolts inserted in the top and bottom sections of the coil. I inserted both bolts and loosely positioned their lock nuts so that final centering of the coil could be accomplished with minimum effort. I attached the top of the coil to the top insulated support bar first and ran the coil's bottom bolt through the bottom support without attaching the securing nut. This was to permit attachment of the two plastic side panels without first adjusting the position of the lower support bar attached to the assembly mast.

At this point of the antenna's assembly, only the 1/4–20 bolts holding the formed metal plates to their respective support bars had been tightened securely.

There are two transparent plastic side panels to be attached to the top and bottom formed plates. One plastic plate contains a terminal. After loosely attaching the top ends of the two side plastic plates to the top plates, loosen the bottom support bar mast clamp and gently raise or lower the bar until the side plate holes line up with the bottom plate's holes. Insert the 1/4–20 bolts. At this point, all 1/4–20 bolts joining metal to metal may be tightened securely.

Those 1/4–20 bolts connecting the side plastic plates to the metal of the top and bottom plates should be tightened with less force than the metal-to-metal bolts to prevent shattering of the plastic. These bolts may be finger-tightened if used in connection with locktite or other thread-locking compounds.

Centering the coil between the top and bottom plates is not difficult. Merely measure the distance between the bottom and top ends of the coil to their respective metal plates—not the support bars. There should be some tension put on the top and bottom formed plates by the coil's bolts that will pull the formed plates in slightly. This increases the rigidity of the plates to eliminate wind flutter and subsequent detuning of the antenna. (See Photo C.)

Pre-soldered wires with closed terminal ends connect the PL-259 antenna cable connector to the coil's top-end winding and the top formed plates. A second closed terminal from the PL-259 connector connects to the coil's bottom-end winding and to the bottom formed plates (see Photo D). The resulting electrical circuit is a simple LC series circuit with the top and bottom plates forming the plates of a capacitor connected in series to the coil.

The final assembly consists of two threaded L-shaped rods on which two small rectangular aluminum plates are attached (Photo B). It would be advisable to round all edges of these plates with a file, including each corner, before attaching to the bolt. This will reduce rf-energy discharge into the atmosphere.

The actual antenna assembly is basically an easy push-in-a-bolt-attach-a-nut operation. At worst, it takes no more than an hour. The hard part comes in the final tuning of the antenna. This is done by moving the tuning plates on the L-bolts until the lowest swr ratio has been reached.

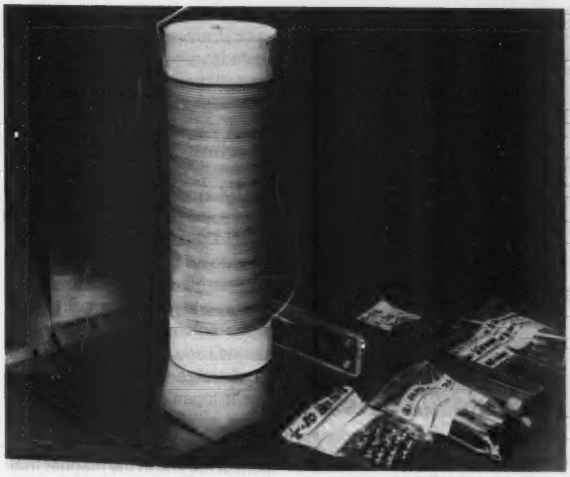


Photo A. The Isotron 160 kit.

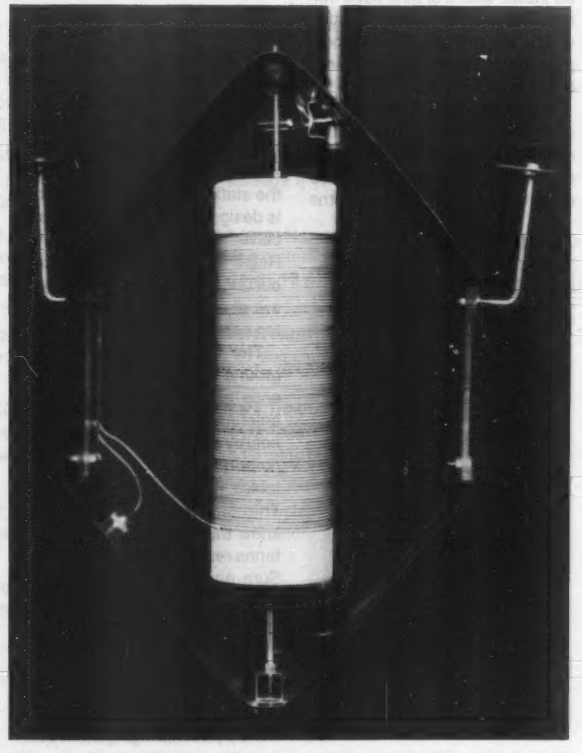


Photo B. The Isotron 160 assembled.

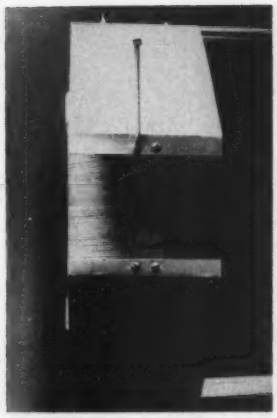


Photo C. Side view. The plastic holds the upper and lower wings together under slight tension.

This will be a trial-and-error approach where you select your transmit frequency, and, at the transmitters lowest power level, tune the finals to resonance and note the swr indication. Now turn off the transmitter and make a very slight change in the positions of both tuning plates. Turn on the transmitter and recheck your swr. This procedure is repeated until the swr lowers to between 1:1.5 and 1:2.0.

The Isotron 160-meter antenna produces such a strong rf field at 100-Watts input that it is unsafe for indoor use. It is best used outdoors at a height above ground where no one walking by could possibly reach it and suffer rf burns or shock.

The advantages of the Isotron antennas are small physical size, no ground-plane radials required, and minimal parts, for trouble-free operation. Its radiation patterns

Photo D. One of the tuning plates.

are typical of ground-mounted vertical antennas when it is connected to ground by an 8-foot-copperclad ground rod. The only disadvantages are tuning it and a somewhat narrow bandwidth.

I believe that a remote tuning system, using plastic components and nylon or monofilament control lines, could be added to the tuning L-bolts that would enable the antenna to be remotely tuned under power to eliminate the present difficulties when frequencies outside of the antenna's bandwidth are wanted.

I visualize connecting the two L-bolts together with a small plastic rod which could be moved forward or backward by the movement of the line in the manner that a pointer on a radio-tuning dial is moved by the dial cord. Another approach would be to use two control lines so that each tuning plate's bolt could be moved independently by a dual-cord system.

I do not know if atmospherics or lack of 1.8 MHz activity in my area was the reason I made no 1.8 MHz contacts in the period I had access to the antenna. I do know that it boosted the background noise level from zilch to S-9 on my FT-102.

James A. Grupton, Jr. KF4PW
Charlotte NC

USER'S REPORT

Ralph Bilal gives you a complete set of instructions for tuning his antennas, and the 160-meter version is no exception. I placed the antenna on a seven-foot mast at ground level and began the preliminary tuning procedure using an MFJ antenna-noise bridge and the station receiver. The antenna is designed to be resonant, as received, just above 2.0 MHz, and Ralph recommends that you try it out under low power to check your swr at a frequency just below the top band edge.

The antenna environment at ground level will make a difference in your results because of antenna capacity to ground and to nearby objects. I supported it temporarily with one of those umbrella tables with a hole in the center. This one was aluminum, and I knew that it would affect the antenna resonance point somewhat. Sure enough, it resonated a bit above 2.0 MHz, but I was able to add the small tuning rods provided and achieve resonance at about 1950 kHz.

There are two rods, one mounted on each side of the antenna at the top plate. Bringing them down from the vertical to the horizontal by simply rotating them on their mounting hardware and retightening them, lowered the resonance to below 1900 kHz. I reasoned that this was close enough for now, and that by mounting the antenna on the roof I would be able to lower the resonant frequency still further.

Incidentally, it would be good to point out that *any* antenna which is only a small fraction of a wavelength in size and consists of "lumped" values of inductance and capacitance, will necessarily have a limited-frequency bandwidth, so I did not expect to be able to cover the entire band with one setting. As it turned out, I was able to cover only 25 kHz either side of resonance without retuning the antenna, but that's getting ahead of the story.

So far, things were going according to plan, and the moment of truth had arrived; it was time to install the Isotron 160 on my chimney mount, up in the clear and away from surrounding objects—or at least as far as possible considering that my "antenna farm" is a hole in the midst of trees, with the nearest being about 25 feet away.

Another point: I prefer antennas that are tuned to resonance at the antenna and not in the shack by means of a coupler or antenna tuner. In other words, I like to bring the coax directly to the transceiver and not have to go through any sort of matching device to make it work. This requires that the antenna itself be properly tuned.

It took only a few minutes to mount the antenna to the chimney bracket and secure it for testing. Since I happened to have RG-59/U available (instead of the RG-58/U which I prefer) I used that, and connected it to the chassis-type connector on the antenna. Tuning up the rig was easy, and the antenna accepted power readily at 1900 kHz—but not at 1850 where I wanted to center it. Back up to the roof again to adjust the tuning rods; down the ladder to the check and another tune-up. After about three trips, I got the antenna to resonate at 1860 kHz—close enough for government work, as they say.

And Now, For The Test

It was necessary only to wait until dark now to test the antenna—a time when I knew that there would be stations available for contacts. As it turned out, I could have done my on-the-air tests right away because there was a contest in full swing! Nevertheless, I did wait until about 2130Z, and began to tune the band.

There was plenty of activity. Normally, I prefer CW operation, but in testing this antenna I reasoned that SSB should be a more difficult evaluation mode because the antenna would really have to put out a good signal to compete with the stations using full-size antennas for this top band.

Tuning, tuning. . .oops, here's one: *"CQ Contest, CQ contest, from VE1ASJ, VE1ASJ, Contest, K."* Frequency 1823 kHz. Quick, now.

"VEQASJ, VE1ASJ from W1XU, W1XU, New Hampshire. Over"

"W1XU from VE1ASJ; five nine of hive, QSL?

"VE1ASJ from W1XU; QSL and thanks, OM. Five nine oh five. Good luck in the contest." Wow, the antenna worked into the Maritimes!

In quick succession, I worked VE3OME (Ontario) and VE2DVI (Quebec) with 5/9 signal reports. Then, I happened upon K2LXN and KA1W; Connie in Parish, New York, and Dave in Bridgeport, Connecticut, having a nice QSO. Calling KA1W, Dave came back with a *"Five nine plus 10 dB, here in Bridgeport OM. Nice signal; how do you copy W1XU, Connie? K2LXN from KA1W."*

"W1XU, with KA1W, here is K2LXN. Nice signal OM in Parish, New York. Five and nine on a noisy band. How do you read me? Over."

"Thanks lot, gentlemen. This is an experimental antenna, and I really appreciate the reports. You're both doing well here through a lot of QRN, and both well above S9. Good chatting with you, and so long from Peterborough, NH. Name is Jim, and I'll be looking for you on 160 again. Seventy three."

Great stuff, this antenna really seems to get out. Frequency was . . . hmm, let me see . . . 1850 kHz. Not bad at all. A little later I heard W3GFR calling CQ at exactly 1850 kHz. There—he's signing.

"W3GFU, W3GFU, W3GFU, here is W1XU, W1XU, Whiskey One X-Ray Uniform in Peterborough, New Hampshire. Over."

"Roger, Roger. W1XU from W3GFU right back. Thanks for the call. Name here is Jim and the GTH is Churchville, PA near Philadelphia. Your signal is five by nine here, with some QSB. How do you read me? W1XU from W3GFU, over."

W3GFU from W1XU. Hi, Jim, good to hear you. My name is Jim,

too, and you're coming through just great; also five by nine here in Peterborough, New Hampshire. I'm running about 100 Watts to an experimental antenna, and would like to see how it goes for a few minutes."

These exchanges lasted for 45 minutes, and during this time I learned that Jim was transmitting on an inverted vee dipole at 40 feet and had a TS-830S (I was using my TS-820S) at about the same power output. His receiving antenna was a coaxial loop, about five feet on a side and rotatable. Although the received signal strength was down a bit on the loop antenna, Jim reported the signal-to-noise *ratio* was better, and he planned to install an amplifier to improve the signal.

When I described my own antenna, Jim was enthusiastic and wanted to know more. He remarked that it ought to be ideal for an apartment dweller, a condo owner, or someone in a travel trailer—virtually anywhere a full-sized antenna couldn't be used. Naturally (with great satisfaction) I agreed.

During the course of the conversation, Jim said: *"100% copy; really amazing! Really hard to believe that it works that well. You're doing a job—and as good as many of the signals I hear from guys running the same or even more power on big, outside antennas. The guy who designed that antenna must be a pretty smart cookie."*

And so it went. Other contacts have been as rewarding, too. On CW and phone, the Bilal Isotron antenna performs very well, indeed—perhaps much better than I had any right to expect. I've had fun with it, but can't claim that under all conditions it will out-perform a big antenna. That would be ridiculous. However, I can recommend it for the ham who needs to operate 160 meters but can't put up a larger one.

Make no mistake, it is a bit fussy to tune, and you're going to have to be patient and take your time with it. The bandwidth in my case is about 50 kHz either side of resonance between the 2:1 VSWR points. Ralph's antenna, which is at 40 feet and tuned to perfection, gives about 100 kHz between the 2:1 vswr points on either side of resonance.

As a last measure, I went up on the roof and painted all of the critical connections with weatherproofing—because I plan to leave it up this winter and enjoy 160!

By the way, I did hear some DX coming through—faintly, but it was there. No hope, of course, to contact it with the Isotron . . . or is there?

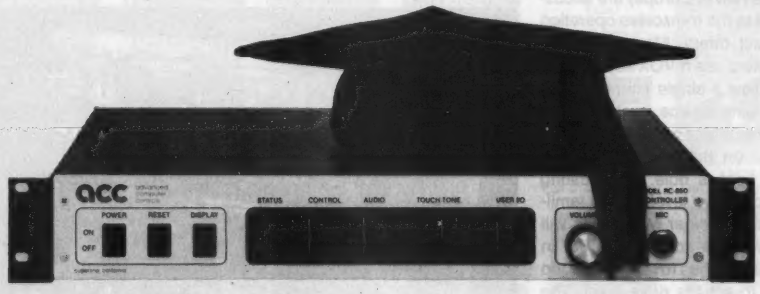
Jim Gray
***73* Staff**

MMT 144/28R TRANSVERTER MICROWAVE MODULES

I love transverters. I've got six of them right now for various assorted purposes on four different bands driven from three different radios. Not surprisingly, five of the six are made by Microwave Modules of Liverpool, England, long the biggest maker of transverters for sale in this country (and perhaps the world as well). MM has long made a quality product allowing transmit and receive conversion of 28-MHz signals to 50, 144, 432, and 1296 MHz, as well as 144 MHz to 50, 432, and 1296 MHz. They even have a model that allows operation on 28 MHz from 144 MHz. Talk about covering all the bases!

Naturally, I was excited to hear about the new line of MM transverters for 1985, which feature GaAsFET front ends and 25 Watts output. In addition, the new models claim input sensitivity as low as 1 mW for rated output. At this time, the only model available in this country is the MMT 144/28R, and I was able to obtain a sample for review from the US importer, the "PX" Shack.

The MMT 144/28R is a handsome unit, as shown in Photo A. This is a big departure from the old black-box approach to transverters—i.e., you set 'em and hide 'em away. With its LED bar-graph power display and attractive faceplate, this unit demands to be set out on your operating desk. MM has retained the rf VOX-type keying of previous models, where your 28-MHz signal actuates the



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transmit section and the drop-out is determined by the front-panel potentiometer.

The rear-panel connections are similar to earlier MMTs. They have retained the 5-pin plug for power and keying. Also included are UHF connectors for 28-MHz transmit and receive signals, as well as a single UHF connector for 144-MHz antenna. This latter departs from previous designs as there is no provision for a separate 144-MHz-receive input, mandatory when using a tube-type amplifier and SPDT relay. (It's my understanding that the factory will make this option available on future models.) It would appear that hams in Great Britain (and possibly the rest of Europe) are accustomed to the transceive operation this unit offers. Most solid-state amplifiers use rf VOX keying also, and allow a single connection to the driving source, switching the amplifier in and out of the line.

Also on the back panel is a small access hole for adjusting the input-drive level. Those familiar with the older MMT units will welcome this access hole, for in the past you had to remove the top cover to set the drive level. The control complement is rounded out by the front-panel power switch on the left and the multifunction switch marked FREQUENCY SHIFT.

This switch also is a departure from previous models. What it does is to incorporate an offset oscillator into the transmit circuit so that you can work repeaters with your FM-equipped HF transceiver. Only the -600 offset is supplied as this is standard in Europe. With the switch in the NORM mode, your transmit signal is offset -600 kHz. In SIMP position, transmit and receive are the same. In REV position, your receive frequency is offset −600 kHz from the transmit frequency. This is similar to what we call a +600-kHz offset here, except we offset the transmit frequency instead. At this time, there is no provision for +600-kHz offset in Europe, so this switch functions as a repeater reverse switch.

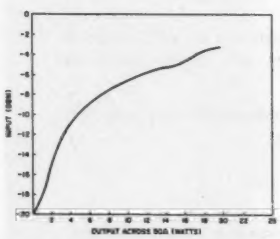

Fig. 1. Input drive vs. output power at maximum sensitivity.

Photo A. The MMT 144/28R transverter.

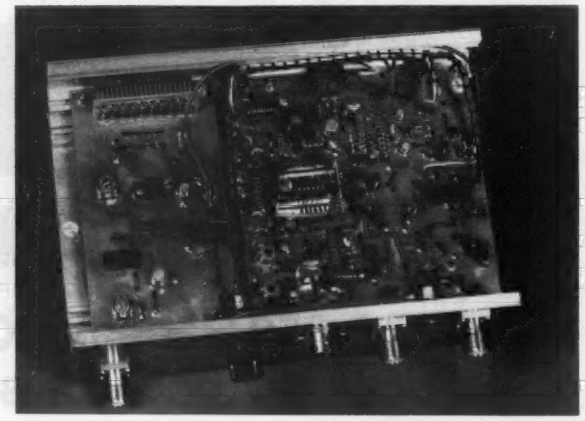

Photo B. Top view with cover removed.

One additional control I'd like to see is the addition of another switch to allow bandswitching the coverage from 144–146 MHz to 146–148 MHz. Ivars Lauzums KC2PX of The "PX" Shack says that this option is being studied and future units may be so equipped. As the unit comes, however, you can work FM simplex and access repeaters in the 145-MHz region using the standard −600-kHz offset. Of course, you could also replace the LO crystal with a 118-MHz unit and the offset crystal with a 117.40-MHz unit to allow this, but you'd give up use of the SSB and CW segments. Hence the request for a bandswitch.

The unit was put into service immediately and a marked improvement was noted on receive signals. The GaAsFET is not rated as far as gain goes, but initial tests over the air indicated it was at least 2 dB better than the standard MMT 144/28R, as far as noise figure goes. (We'll substantiate performance claims shortly.) The receiver displayed good performance in the presence of strong local adjacent signals, such as stations S9+60 dBm, 10 kHz away. Measurements bore this performance out in the lab.

Driving the unit with my ICOM 740 resulted in 23 Watts output power across 50 Ohms at 13.8 volts dc. I could not increase this output to the rated 25 Watts, and the input mixer appeared to be saturated at the given drive level. Subsequent conversations with Ivars resulted in the adjustment of the internal ALC circuit, which then yielded 25 Watts output. In fact, with a Bird 50-Ohm termination, I was able to increase output all the way up to 28 Watts but set it back to 25 which is more than adequate for my requirements. Since I use both solid-state and tube-type amplifiers, I need only 1 to 3 Watts of output and a step attenuator in series with the 28-MHz transmit input. This is switched out for QRP use or for driving a solid-state amplifier.

One peculiar problem cropped up early: After keying the circuit several times, it locked up in transmit. However, with the FREQUENCY SHIFT in NORM or REV, I was able to unlock the unit. Soon, however, these positions locked up as well. Careful study of the schematic resulted in clipping a diode to the offset oscillator circuit, and that did it. I was back on the air. It seems that the quad op amp LM324 used to effect the switching of the offset oscillator schemes blew up for some strange reason—perhaps none other than it was a defective chip. I replaced it with a new chip and installed a socket in case of future trouble, which hasn't occurred. This is a quirk the manufacturer is looking into.

After spending many hours working SSB and CW, I fooled a bit with the offset oscillators and worked several repeaters in the area in the 145-MHz range, getting excellent signal reports. Of course, this is no way to measure linearity, especially on FM! So, after arrangements were made, we trucked the units off to a local test lab to make some honest-to-Abe measurements using sophisticated equipment.

For the bulk of our tests, we em-

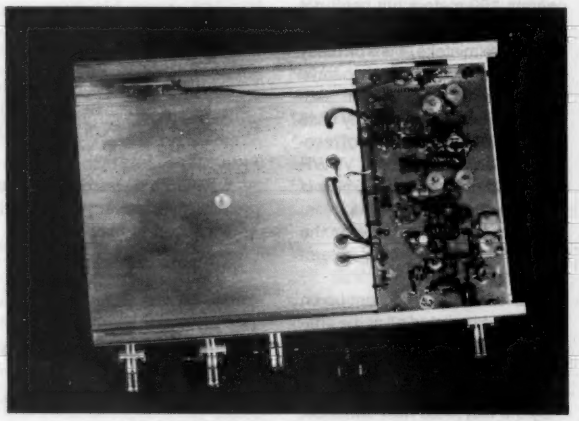

Photo C. Bottom view with cover removed.

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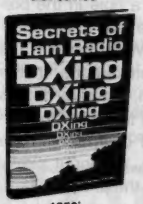

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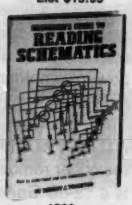

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ployed a Hewlett-Packard 8640B generator and 8554-141T analyzer. No noise-figure measurements were made, due to the lack of the right test equipment. The first test we ran was receiver conversion gain, claimed to be 22 dB ± 1 dBm by the manufacturer. We measured 19 dB at 144.0 MHz and 20.8 dB at 146 MHz. (A second unit measured 21 dB at 144.8 MHz.)

Sensitivity was found to be 0.07 uV for 10 dB S+N/N (−130 dBm)—more than adequate. In fact, excellent! But the associated problems of receiver crunching in the presence of a strong signal often come with high gain and sensitivity figures.

How did the MMT 144/28R do? We calculated the 1-dB compression point to be +6 dBm, which is very good for a GaAsFET front end. As a reference point, another manufacturer of preamplifiers in Europe sells a 144-MHz GaAsFET preamp with a 1-dB compression point of −4 dBm, indicating that likely it would have trouble with relatively strong signals encountered in everyday operation.

We found that the transmit section is relatively linear, although saturation occurred with an input of .4 mW for 17 Watts output. Fig. 1 shows input drive vs. output power. These tests were made using the signal generator directly into the 28-MHz input, and the output of the transverter terminated into a Bird 50-Watt Termaline resistor, and power was measured on a Bird 43 with 50-Watt 100–250-MHz slug installed. The second harmonic was down −48 dB from the reference signal, and the third harmonic down in excess of −60 dB. No spurs were evident. The transmit section complies easily with FCC regulations. These measurements were taken at both 10 Watts and 15 Watts output.

To anticipate your next question, we didn't measure gain of the front-end rf stage. But as you can see from the sensitivity and compression-point data, the front end is more than adequate for weak-signal work. This is one transverter that doesn't need a preamp in front of it. In fact, such a scheme would lead to degradation of the receiver performance, and unless you are trying to overcome 10 dB of feedline loss, I wouldn't recommend it.

Incidentally, the transverter uses a GaAsFET to drive the diode ring mixer, which helps dynamic range considerably over an active mixer. This is a common scheme on the newer HF transceivers and there's no reason why it can't work at VHF, either. It would appear also that MM has tamed the GaAsFET and made it a valuable addition to the VHF station. Based on actual over-the-air tests, I'd guess that the noise figure is probably under 1 dB with room to spare.

To sum it up, the MMT 144/28R represents a real step forward for the transverter user—not just in performance but in appearance and flexibility as well, what with the additional offset oscillators for FM work. The power output is sufficient for QRP work or for driving a higher-power amplifier, especially the newer grounded-grid types using 3CX800 tubes. These amplifiers typically need 20–30 Watts to attain full output, which has been a problem with the earlier transverters. Now you can set aside that intermediate amplifier!

Discussions with Ivars also reveal that some models of the MMT 144/28R can make as much as 45 Watts output with the ALC shut off, but this is risky operation. Surely the circuit can tolerate 30 Watts output, which is safely within the drive requirements of the 3CX800.

As regards the output, the heat sink is simply a thick piece of aluminum to which the PA stage is bolted. This piece of aluminum is contained within the transverter and appears to do a sufficient job of drawing off heat, but I'd still prefer an external heat sink that could be air-cooled—especially on a hot day!

The MMT 144/28R is available from *The "PX" Shack, 52 Stonewyck Drive, Belle Mead NJ 08502.* Price class: $350.

Peter H. Putman KT2B
Morris Plains NJ

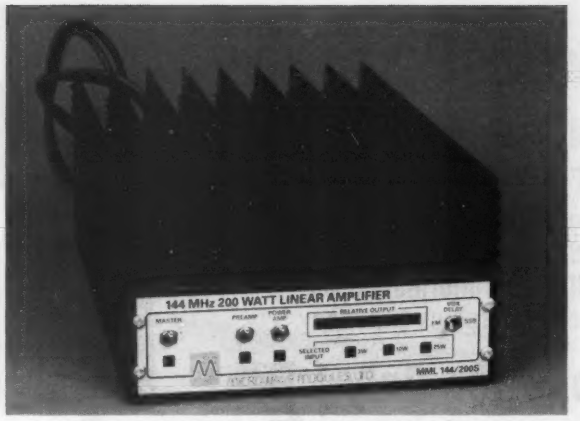

Photo A. The MML/200-S, 200-Watt, 144-MHz power amplifier.

POWER AMPLIFIER/ MICROWAVE MODULES

Many readers are familiar with Microwave Modules transverters and receiving converters. But MM also manufactures a fine line of solid-state rf power amplifiers for the VHF and UHF spectrum which are very popular in Europe. Continuing along these lines is the new MML/200-S amplifier for 144 MHz, with several interesting features.

First of all, the heat sink is massive. This is one of the few high-power rf amplifiers I've seen that really can hold its power! It's big, all right, but you can still fit it in the trunk of your car, should you desire to go mobile. Front-panel layout is uncluttered, with separate switches for MASTER POWER, PREAMP ON, POWER AMP, and VOX DELAY. A front-panel LED bar-graph indicator shows relative output, and three other LEDs show the input mode selected (see Fig. 1).

A word about the input mode: MM has come out with a truly universal amplifier, and the user can select input sensitivity ranges of 25, 10, or 3 Watts. Now *that's* flexibility! Everyone from the FT-290 user to an IC-271 can run 200 Watts now with the same amplifier. The selection is made using a standard screwdriver to rotate a switch through a hole in the bottom cover in the rear of the chassis. In the 25-Watt position, the finals are driven directly. In the 10-Watt position, the driver comes into play with a fixed 50-Ohm attenuator ahead of it, and in the 3-Watt position, the input signal goes straight to the driver.

The transistor line-up features Thompson-type SD1275 in the driver with a pair of SD1477 finals operating into a hybrid Wilkinson power combiner. The gain of the final stage is 10 dB.

Fig. 2 shows the bottom of the amplifier and the PC board with the cover removed. Also included is a 12-dB GaAsFET preamplifier which is switchable from the front panel and is automatically switched when transmitting. The rf VOX circuit determines the drop-out delay, and is used only when the rf-sensing circuit comes into play. In my station I prefer to hard-key the amplifier through the rear-panel RCA jack, which is grounded for transmit.

Performance! Performance! I hear you screaming! Hold onto your hats, for this unit really makes the grade. Initially, I evaluated the receiver preamp section with Steve Katz WB2WIK, using Hewlett-Packard 8554-141T analyzers and an H-P 8640B generator. MM claims 12 dB of gain and deliberately minimized gain so as to not overload the front end of a multimode transceiver which would be used with the preamp. Good move!

This, of course, keeps compres-

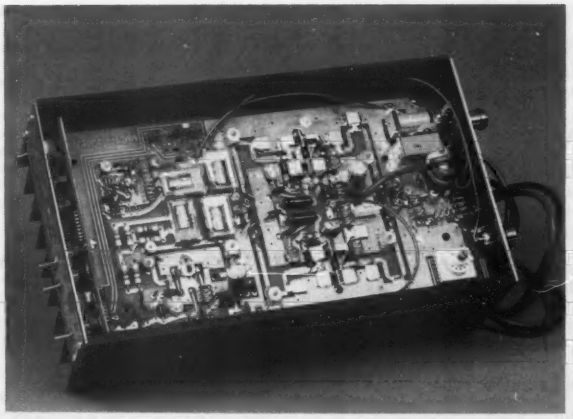

Photo B. Underside of the MML/200-S showing input-selector switch, lower right.

25-Watt Range (Swr calculated at 1.75:1)

Calibrated Input	Measured Input	Measured Output
2.0	2.5	50
3.0	3.5	60
4.0	4.5	80
5.0	5.5	100
6.0	6.5	110
7.0	7.5	120
8.0	9.0	135
9.0	10.0	140
10.0	12.0	150
15.0	17.0	170
20.0	23.5	180
23.0	27.5	200

3-Watt Range (Swr not calculated)

Calibrated Input	Measured Input	Measured Output
.50	.45	100
1.0	.75	150
1.5	1.25	170
2.0	1.5	180
2.5	2.0	190
3.0	2.5	200

10-Watt Range (Swr calculated better than 1.1:1)

Calibrated Input	Measured Input	Measured Output
1.0	1.0	80
2.0	2.0	125
3.0	3.0	150
4.0	4.0	165
5.0	5.0	180
6.0	6.0	190
7.0	7.0	192
8.0	8.0	195
9.0	9.0	198
10.0	10.0	200

Fig. 1. Power-output tests. Drive source: ICOM 740 driving MMT 144/28R with step attenuator on 28-MHz transmit line. Dc power: ASTRON Model RS-35 35-Ampere, 14.0-volt regulated dc supply. Input calibration: Bird Termaline 25-Watt coaxial resistor. Output load: Cushcraft 32-19 Boomer (Type. Imp. 50 Ohms at 144.150 MHz). Input and output measured with Bird Thruline 43 wattmeters using 5-, 10-, 50-, 100-, and 500-Watt slugs. Input drive first calibrated into dummy load, then applied to MML 144/200. Input and output measured simultaneously. Dc voltage monitored, dc amperage unknown.

sion point high and also helps dynamic range. In our tests, we verified the gain to be 14 dB—a bit higher than claimed, but useful. The 1-dB compression point is +6 dBm, very good for a 144-MHz GaAsFET. This means the MML-200-S preamp will hold its own in the presence of very strong local signals. Sensitivity was calculated to be −124 dBm at 10 dB S+N/N. The minimum discernable signal (MDS) was −133 dBm.

Now, on to the power measurements. For these tests, I used an ASTRON RS-35 power supply set at 14.0 volts. The driving source was an MMT 144/28R transverter, excited by a Kenwood TS-430S. A step attenuator was put in line from the TS-430 to the MMT 144/28R. Next, I ran the output from the transverter through a Bird 43 wattmeter, using 5-W, 10-W, and 50-W slugs for calibration. Finally, the input went through a coaxial switch to either a 25-Watt Termaline load for calibration or the amplifier.

The output of the MML 200-S was monitored using a 50-Ohm load and Bird 43 with 100- and 500-Watt slugs. The reason I put the coax switch at the input with the dummy load is that inputs to solid-state amplifiers usually don't look like 50 Ohms, so my readings would have been falsified. Fig. 1 shows calibrated input power, measured input power, and output power in the 3-, 10-, and 25-Watt positions.

One thing that becomes evident right away is that the input to the final amplifier stage is not 50 Ohms. In fact, it calculates out to about 85 Ohms! That's not surprising in view of what I stated earlier. Remember that in this mode, your input signal drives the final stage directly. In the 10-Watt stage, the swr is excellent, but this is due largely to the resistive pad employed at the input to the driver. Here, calibrated and measured readings agreed each time.

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50 watts	50H	50A	50B	50C	50D	50E
100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
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In the 3-Watt position, the swr appeared to be lower than 50 Ohms, probably around 25 Ohms. Here, your signal goes directly to the driver stage, and don't use anything more than an HT here! You could damage the driver if you hit it with 10 Watts of power. Again, use caution in selecting the desired drive range.

When was the last time you saw an amplifier that put out 200 Watts for 2.5 Watts of drive? Or, for that matter, 100 Watts output for 1/2 Watt of drive? (This amplifier ought to make happy those types who insist on using handie-talkies as mobile rigs.) We did not measure linearity, although on-air reports have been good. At no time was I able to get more than 200 Watts out of the amplifier, and at that output level the voltmeter still indicated 14 volts. MM rates the current consumption in this mode at 30 Amperes, so the RS-35 can do the job nicely.

In this particular model, the rf VOX keying didn't work at all. I'm not sure what caused this problem, but the unit I obtained was one of the early production models, so I must assume component failure. One other area of complaint is the method used to connect the front panel to the internal circuit board: The panel uses a 7-pin inline socket, much like half an IC socket, while the circuit board has a mating plug.

Unfortunately, there is no way to see if these two parts mate when attaching the front panel, so I spent nearly a half-hour after making the receiver tests trying to get the panel back on and make contact. Conversations with the US importer indicate that this method of connection has been changed to a flexible ribbon cable. At least the folks at MM are responsive to complaints!

This is indeed a clever amplifier, and one which any 144-MHz operator would love to have in his or her station. The advantage of being able to custom-tailor your input-drive requirements make it only that much more desirable, and it takes care of the need for a high-power amplifier for SSB/CW and FM simplex work. I'd venture to guess that it would also work nicely in repeater service, derated to the 100-Watt level with a small cooling fan. That is indeed an enormous heat sink!

Price class: $400. US importer: *The PX Shack, 52 Stonewyck Drive, Belle Mead NJ 08502.*

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The NES Slimline ohmmeter.

UNCLE BILL'S SOFTWARE CODES AND ANTENNAS

Uncle Bill's Code Course is a Morse code training program designed for the Commodore C-64 and C-128 computers. The Code Course is very user friendly. The program is broken into three parts, allowing instruction at any level from beginner to professional.

Part 1 introduces each character by calling for the student to press a key, then hear the properly sent Morse code equivalent and view the character on the screen. The sight and sound combination is used for emphasized (dual sensory) learning.

Part 2 sends a properly formed Morse character and requires the student to respond by pressing the appropriate key. If an incorrect response is made, the character will be resent. This will continue until the proper response is made, or a special key is pressed to assist the student. At the end of each session in this part, the computer will grade the student's progress.

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Random code groups were selected, as they are the most difficult to "copy." Mastering of this section will enable the passing of any code test given, including the commercial Radio Telegraph Operators test.

All Morse is sent at 20 WPM. Hence, the student has only to learn character sounds once. This method is sometimes referred to as the Farnsworth method. Varied sending speeds in Part 3 are attained by adjustable spacing between the characters.

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For further information, contact: *Uncle Bill's Fine Software, PO Box 2403, Falls Church VA 22042.*

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For the do-it-yourselfer, Bob has included a special home projects section with easy-to-build filters, tuners, receivers, descramblers, antennas, power supplies, converters, amplifiers, and other essential accessories for the serious listening hobbyist.

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YAESU HAS TWO NEW IN-LINE METERS

Yaesu Electronic Corporation announces two new in-line swr and power meters. The YS-60 measures both average and peak power output, reflected power, and vswr in the range from 1.6 to 60 MHz. The YS-500 performs the same measurements covering the 140-to-525-MHz range. Three functions provide monitoring of either forward or reflected average transmitter output power for CW, AM, FM and FSK modes, and vswr for testing the performance of antennas. The linear circuit design assures accurate measurements with minimum insertion loss over the entire specified frequency range, even at low power levels.

For further information, contact any Yaesu dealer or Yaesu Electronics Corporation, PO Box 49, Paramount CA 90723.

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Atari Explodes

Atari's new computer serious threat to Macintosh. Will the Amiga survive?

The Atari 260 ST is a serious challenge to the Apple Macintosh and will open up a major fight in the personal computer market.

By Joseph Sugarman

Imagine this. If I could offer you a Macintosh computer—(a computer that sells for over $2000)—for one third the price, you might wonder.

But what if I offered you a better computer with none of the disadvantages of the Mac and what if I added new features which improved its speed and performance? That's exactly what Atari has done in an effort to grab the ball from Apple and really explode into the personal computer market.

HEADING EFFORT

Heading the effort at Atari is Jack Tramiel—the same man who built Commodore into a billion dollar corporation, sold more computers than any other man in the world and believes in giving the consumer incredible value without sacrificing quality. The new Atari is a perfect example.

First, let's compare the new Atari ST to the Macintosh and the Commodore Amiga. Sorry IBM, we can't compare the ST to your PC because yours is almost five years old, much slower, and, in my judgement, over priced.

Price The cheapest you can get the Macintosh with 512K of memory is $1800 with a one-button mouse, a disk drive and a monochrome monitor. The Amiga sells for $1995 with a two-button mouse, a disk drive and a color monitor. The Atari ST sells for $699 with a two-button mouse, a disk drive and a monochrome monitor and for $200 more, a color monitor. Read on.

Monitor With the Mac you can only use its 9" monochrome monitor and with the Amiga you can only use its 12" color monitor. With the ST you have a choice of either a 12" monochrome or high-resolution color monitor or your own TV set.

Resolution The number of pixels or tiny dots on a screen determine the sharpness of a computer monitor. The Mac has 175,104 pixels and has one of the sharpest screens in the industry. The Atari ST has 256,000 pixels or almost a third more than the Mac. And the Atari color monitor compared to the Amiga in its non interlace mode is 128,000 pixels or exactly the same.

Power All the computers have a 512K memory with a 68000 CPU operating with a 32-bit internal architecture. But Atari uses four advanced custom chips which cause the CPU to run faster and more efficiently giving it some tremendous advantages. For example, it has a faster clock speed of 8Mhz compared to the Mac's 7.83 and the Amiga's 7.16. And the speed of the unit is hardly affected by the memory requirements of the monitor which in the Amiga can eat up much as 70% of the unit's cycle time or speed.

Keyboard This is the part I love. The Mac has a small 59-key keyboard and a mouse. That's all. The 95-key Atari has both a mouse, cursor keys, a numeric keypad and ten function keys. The keyboard looks fantastic and is easy to type on. Although the 89-key Amiga has almost all the features of the Atari keyboard, it looks like a toy in comparison. (Sorry Commodore, but that's my opinion.)

Disk Drive The Mac's 3½" disk drives run at variable speeds—slowing down as they run. The Atari 3½" drives run faster at a constant speed—and quieter than any other unit.

Features The Atari ST comes equipped with the same printer and modem ports as the IBM PC—a parallel and RS232C serial port. The Mac comes only with a tiny non-standard serial and modem port. The ST has a hard disk interface capable of receiving 10 million bits per second. There are two joy stick ports and a 128K cartridge port for smaller programs or games. It has 512 colors (for the color monitor), it has a unique MIDI interface into which you can plug your music synthesizer and record or play back your music.

Software Right now, the Mac has more than the Atari ST and the Amiga combined. The Atari is a new system but the track record of Atari's Jack Tramiel and the potential of the new unit is causing a flood of new software titles. In fact, I'll predict that eventually the Atari will have more software than the Mac. There are now hundreds of titles, from word processing to spread sheet programs, from graphics and games to data base management—all with those easy drop-down menus and windows. There's plenty from which to select now and plenty more to come.

If you think I'm enthusiastic over the ST, listen to what the press is saying. *Byte Magazine* just called it the "Computer of the year for 1986." *Creative Computing* exclaimed, "Without question, the most advanced, most powerful micro computer your money can buy." and finally, the Atari ST is the best selling computer in Europe and acclaimed, "The computer of the year," by the European personal computer press.

I am going to make the ST so easy to test in your home or office that it would be a shame if you did not take advantage of my offer. First, I will offer the computer itself for only $299. You will need, in addition, either one or two disk drives and either an Atari monochrome or color monitor or your own TV. If you order with your credit card during our introduction I will ship your order and only bill you for the postage and 1/3 the purchase price. I will also add a few software packages free including "Logo"—a beginners programming language, a disk for programming in BASIC and Neochrome—a graphics paint program.

COMPARE THE TWO

After you receive the Atari ST, put it next to your Mac or Amiga or even IBM. See how extremely sharp the graphics appear, discover what a perfect word processor it is, how great the keyboard feels and finally how much faster and quieter it runs.

If you're not convinced that the Atari is far superior to your present computer and a fantastic value, simply return it and I'll refund your modest down payment plus our postage and handling charges. If you decide to keep it, I'll bill your credit card account for the remaining balance and enroll you in our discount software club (a $50 value) that lets you buy software for up to 50% off the retail price.

But act fast. We have only 2,000 units and 1,000 free memberships that we will offer as part of this introductory program and we are certain they will go fast. Order today.

To order, credit card holders call toll free and ask for product by number (shown in parentheses). Please add $20 per order for postage and handling. (If you pay by check, you must pay the full amount but we will provide you with a bonus software package.)

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RGB Color Monitor (4058B) **399**

Note: A list of software will come with the unit.

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NEVER SAY DIE

from page 4

So, what have you found to work best in spreading HI? Has anyone found demos in shopping malls to do anything? Most of the ones I've seen have kept the public so far away that they couldn't see, hear, or understand what was going on. There's a self-destructive drive to show off esoterica such as slow-scan or RTTY at fairs and malls. These are just ego-gratification exercises. If we want to get HI around we may do better to stick to simple things like voice communications and rag-chewing. What've you found?

To change metaphors, I think you may find that it's important both to expose and re-expose the potentially infected to the virus. It's sort of like getting them to take the bait, then setting the hook.

In my case, Fred had me baited, but the hook didn't really set until about five years later when someone gave me a box of radio parts. There were enough for me to build a radio circuit out of Popular Mechanics. The hook was set—permanently. So let's hear it on how you got caught up in amateur radio. Did you go for the bait and get hooked like I did? We can learn how to spread our joy to others if we share our experiences.

Yes, I know, you've probably never written to an editor before. Well, that sort of irresponsibility doesn't wash with *73*. When you send in your subscription you're just getting started here. I expect you to join me and the others to get some recognition for the hobby, to get more hams, and to help get us back to where every major communication development has been invented and pioneered by hams, the way it used to be before 1963.

Did a ham magazine have much to do with your getting licensed? If so, try to remember what it was that did it to you. Let me know so I can do it some more. I can make *73* any way I want it, and what I want is to make it so it's got what you want to read and will help amateur radio to grow. Let me hear from you.

WHILE YOU'RE WRITING

One thing that is never far from my mind is getting a new piece of ham gear. So, like you, I read over the ads carefully. Since the smaller the type, the better the bargain, I tend to get out my magnifying glass and go over the dealer ads with particular care. But I find myself getting confused. Oh, I know most of the model numbers, but not all. And I remember some of the recommendations I've gotten over the air, but I'm not so sure about some of the gear I'm interested in buying.

What I'd like to see is a regular listing—maybe quarterly—of what you think of all that ham gear you've bought. If you'd just go through your ham shack, list the gear you're using and let me know how you like it—say, on a scale from zero to nine—I'll tote up the votes and run them in *73*, listing the make, model, number of votes, and average score. Sure, I expect a manufacturer will send in a nine for his equipment, and his competitor will send in a zero. But by the time we have a few hundred votes, we'll have a very good idea of where truth lies.

Another thing. I enjoy reading the reviews of new products as much as you do. But I'd much rather know the opinions of a dozen or so active hams who bought the unit, after using it for a few weeks, than the opinion of some joker who is writing to make money and who doesn't want to make the manufacturer mad by being too critical. I want to know what the average ham thinks of the product—what you think of it. So, the next time you buy a new piece of gear—an antenna, a rig, an HT, test equipment, or anything else—once you've used it for a while and know its good and bad points, how about dropping me a letter and telling me what you've found? If I print it I might just extend your subscription a month or two—maybe a year, if I find your opinions particularly interesting. Mostly you'll be doing it either to help other hams avoid a bad experience or to help a manufacturer who has brought out something worth knowing about. Here's a chance to talk about ease of use, instructions, damned-fool dials, weird connectors, good signal reports, and so on. We're supposed to be communicators, so let's communicate!

Most of us will be particularly interested in what you think of the products which are currently being advertised in the ham magazines. But I think we also will be interested in older products, ones we see at flea markets and ham auctions, so don't figure it's too late once something has been out for a year or so. Heck, I'm still seeing Gonset Communicators selling at Dayton!

Once I'm able to get your Home Test Report into *73*, I'd like to set up a place on the reader-service card for everyone to vote for the most helpful report of the month, with perhaps a $100 reward for the winner. I believe that good actions should be rewarded.

Send your reports to Home Test Reports, *73* Magazine, WGE Center, Peterborough NH 03458. And, yes, I want to hear from hams anywhere in the world.

AND ANOTHER THING. . .

The word is that a few of you have been busy doing more than just rag-chewing. I don't put much stock in these reports, but just in case you have been playing around with some crazy things like slow-scan, RTTY, satellites, moonbounce, or such, know that I want to hear more about what you're doing and, if you know, why you're doing it.

It's been years since I used RTTY, so I hardly know where to start today. What do you recommend I buy? Do you have to build anything? Who's on the air for me to talk with? How about contests? How many get involved and what does it take to win? How many countries can I hope to work on RTTY these days? How many standards are there? Do I use the old five-bit code, ASCII, or what? My old 1948 RTTY gear should probably be in a ham museum now.

Is there any reason for me to get going on slow-scan again? I tried that around 15 years ago and had a ball. But then, like most everyone else, I got bored with the lack of program material from others—and lazy in making my own. I remember a chap getting DXCC on slow-scan—how many countries might I work today if I had a good station? Are any DXpeditions dragging along slow-scan equipment? I remember making SSTV contacts when I operated from KC4DX on Navassa back in 1972, and also from Amman as JY8AA, and also from JY1 in 1973.

What's my best bet in gear to work through OSCAR these days? My old 432/145-MHz 1975 setup is long gone. My best DX was Moscow, where I had a 20-second window one day. That took some doing—and luck. But what should I get now to get on with a good signal? If you're working the satellite with some success, let me know what I need in a rig, a receiver, and antennas.

One of my great enthusiasms around 15 years ago was cross-band repeater operation. I had WR1AAB set up on our nearby Pack Monadnock mountain, with cross links to six and ten meters. With that, the local two-meter gang was able to make lots of contacts all around South America. I had another repeater setup at home linked to twenty meters. The FCC scotched that for a few years, but now it's blooming again and I'd like to know what you're doing along this line. Who knows, I might be in your neighborhood and want to see what I can work. I get around a lot—a whole lot.

So if you're having fun with some special ham interest, tell me

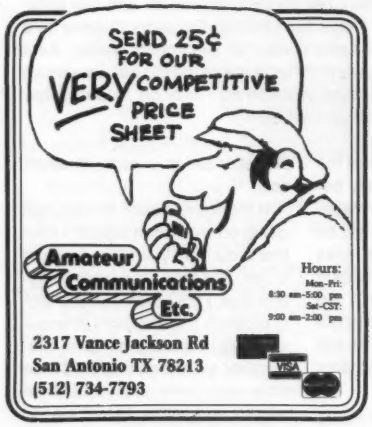
Hmmm, that paunchy chap on the left has been dipping into too many dim sum. That's me with Tim Chen BV2B in the middle and Ken Miller K6IR on the right. Ken and I have been visiting Tim every October for a while while on a round of Asian consumer electronics shows. As a matter of fact a surprising number of hams are on the trip with us—which makes it all the more fun. Maybe you worked Tim or his recent visitor, Barry Goldwater, during their January stint.

and the other 73 readers what you're doing, why it's fun, and how we can join in the fun. What can we build? What can we buy? What short cuts are there to save some money or time? How about some references to good information sources?

GOOD HELP

If I'm going to get *73* back into shape, I'm going to need a lot of help. I know some things to do and you'll tell me more, but I'm looking for someone for my staff who can make my W2NSD/1 ham station really sing. I want to work with someone to help me get active on OSCAR again, to get on RTTY again, and to see what I can do with packet radio. If you know of someone with some experience in some of these things and who would like more than anything else to make hamming a life's work, someone with some technical smarts—any age, any sex, any race, any religion—pass the word!

Look out *Ham Radio*! Look out *CQ*! *73* is going to do those things which should be done so you won't want to miss an issue—and maybe we can get amateur radio itself moving again. We have the greatest hobby in the world, and that's not just puffery. Our hobby is the key to getting our country back into the act in consumer electronics, so you and I have a responsibility. We've got to make amateur radio and the fun it provides known. I need your help to do this. If we can work together, nothing can stop us!



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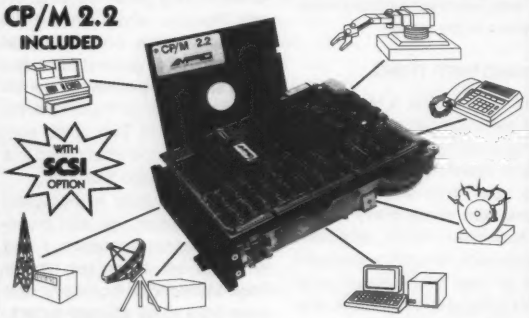

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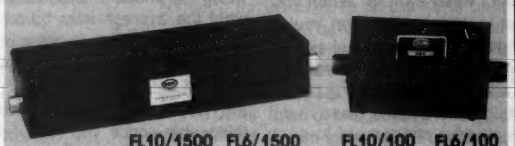

FL10/1500 FL6/1500 FL10/100 FL6/100

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CONTESTS

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DX CONTEST—
PHONE ARRL INTERNATIONAL
Starts: 0000 UTC March 1
Ends: 2400 UTC March 2

This annual DX contest for all DX hunters is sponsored by the ARRL and open to all amateurs worldwide. W/VE amateurs are to work as many amateur stations in as many DXCC countries as possible on 1.8 to 30 MHz, excluding the 10-MHz band. Foreign amateurs are to work as many W/VE stations in as many states and provinces as possible. Check *QST* for any last-minute rule changes. Operating categories include:

(A) Single Operator—one person performs all operating and logging functions. Spotter nets are not allowed and only one transmitted signal may be used at any given time. Within the single-operator category, participants may compete within all band or single-band categories as well. Single-band entrants who make contacts on other bands should submit logs for checking purposes.

(B) Multi-Operator—more than one person operates, checks for duplicates, logs, etc. Within this category, entrants may compete within single-transmitter, two-transmitter, or unlimited-transmitter categories. Single transmitter implies only one transmitted signal at any given time and once station has begun operation on a given band, it must remain on that band for at least 10 minutes. Listening time counts as operating time. Multi-op single-transmitter stations must keep a single, chronological log for the entire contest period.

Two-transmitter multi-op entrants are limited to only two transmitted signals at any given time. Again, each station must stay on a given band for a minimum of 10 minutes. Both transmitters may work any and all stations; the second transmitter is not limited to only working new multipliers. Each of the transmitters must keep a separate log.

With an unlimited number of transmitters for multi-op entrants, only one transmitted signal per band is permitted at any given time. Separate, chronological logs must be kept for each band.

(C) QRP—10 Watts input or less (or 5 Watts output or less), single operator, allband only.

Operators must observe the limitations of their operator licenses at all times. Your callsign must indicate your DXCC country station location. One operator may not use more than one callsign from any given location during the contest period. The same station may be worked only once per band; no crossmode, crossband, or repeater contacts. Aeronautical- and maritime-mobile stations outside the US and Canada may not be worked for QSO or multiplier credit by W/VE stations. All transmitters and receivers must be located within a 500-meter-diameter circle, excluding directly-connected antennas. This prohibits the use of remote receiving installations. However, multi-operator stations may use spotting nets for multiplier hunting only.

EXCHANGE:

W/VE stations send RS and state or province. DX stations send RS and power as three-digit number approximating transmitted input power.

SCORING:

All stations count 3 points per valid QSO. W/VE multiply QSO points by sum of DXCC countries (except US and Canada) worked per band. DX stations multiply QSO points by number of US states (except KH6/KL7) and District of Columbia (DC), VE1–7, VO, and VE8/VY1 worked per band (58 maximum per band).

AWARDS:

Plaques awarded to top W/VE scorer in each entry category; top scorer in the single-operator allband category worldwide and on each continent; worldwide leaders in the single-operator single-band, QRP, multi-op single-transmitter, multi-op two-transmitter, and multi-op unlimited categories—plus additional special plaques as sponsored. Certificates will be awarded to top single-operator, allband entries from each country and ARRL section; top single-band entries in each US call area and each country; top multi-op entries in each country, US call area, and in Canada. Additional single-band and multi-op certificates will be awarded if significant effort or competition is displayed. Also, DX entrants making more than 500 QSOs on either mode will receive certificates. ARRL affiliated clubs also compete for gavels on three levels: un-

CALENDAR

Mar 1–2	**ARRL International DX Contest—phone**
Mar 8–10	**Virginia State QSO Party**
Mar 15–16	**YL-ISSB QSO Party—CW**
Mar 15–16	**Bermuda Amateur Radio Contest**
Mar 29–30	**Rio CW DX Party**
Apr 12–13	**CARF Commonwealth Phone Contest**
Apr 14	**ARRL 144-MHz Sprint**
Apr 22	**ARRL 220-MHz Sprint**
Apr 30	**ARRL 432-MHz Sprint**
May 8	**ARRL 1296-MHz Sprint**
May 17	**ARRL 50-MHz Sprint**
May 31–Jun 1	**National 6-Meter Invit. Net Activity Day Contest**
Jun 7–8	**ARRL VHF QSO Party**
Jun 28–29	**ARRL Field Day**
Jul 1	**CARF Canada Day Contest**
Jul 12–13	**IARU Radiosport Championship**
Aug 2–3	**ARRL UHF Contest**
Aug 16–17	**New Jersey QSO Party**
Sep 13–14	**ARRL VHF QSO Party**
Oct 11–12	**Rio CW DX Party**
Nov 1–2	**ARRL Sweepstakes—CW**
Nov 15–16	**ARRL Sweepstakes—phone**
Dec 5–7	**ARRL 160-Meter Contest**
Dec 13–14	**ARRL 10-Meter Contest**

limited, medium, and local clubs.

ENTRIES:

All entrants are encouraged to use official forms available from ARRL headquarters to report contest results. Logs must indicate times in UTC, bands, calls, and complete exchanges. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 total QSOs must include cross-check sheets (dupe sheets). All operators of multi-op stations must be listed.

Entries must be postmarked within 30 days of the last contest weekend, otherwise they will be classified as check logs—no extensions, no exceptions. All stations are requested to send their entries in as early as possible. Each entrant agrees to be bound by the provisions of the ARRL rules, licensing authority, etc. The decisions of the ARRL Awards Committee are final. Usual ARRL disqualification rules apply. Address entries and forms requests to ARRL Headquarters, 225 Main St., Newington CT 06111.

VIRGINIA QSO PARTY
Starts: 1800 UTC March 8
Ends: 0200 UTC March 10

The 1986 QSO party is again sponsored by the Sterling Park Amateur Radio Club of Sterling Park VA. The same station may be worked on each band, once on each mode. VA stations may contact in-state stations for QSO and multiplier credit. VA mobile stations must sign as mobile and may be worked in each new county they operate from for new QSO and multiplier credit regardless if previously worked on the same band and mode in another county. Stations on county-line borders count for only one QSO regardless of the number of multipliers they offer. QRP stations must run 5 Watts or less for their entire operating time.

EXCHANGE:

QSO number starting with 001 and QTH consisting of state, province, DX country, or VA county. VA stations note that the reference for valid counties is the *CQ's Counties Award Record Book*, which lists a total of 95 counties.

FREQUENCIES:

Phone—3.930, 7.230, 14.285, 21.375, 28.575, and anywhere on 160-meter band except in DX windows. CW—60 kHz up from the low end of each HF band and anywhere in 160-meter band or Novice subbands.

SCORING:

Count one point per voice QSO; two points per non-voice QSO (RTTY, CW, SSTV). No cross-mode QSOs. VA stations multiply total QSOs by the sum of states, Canadian provinces, DX countries, and VA counties worked. Others multiply QSOs by the number of VA counties worked. VA mobiles may count fixed stations only once as multipliers. VA stations vying for the CW-only award will have only CW contacts and multipliers counted.

AWARDS:

Engraved plaques to the top-scoring stations in the following categories: High VA single operator (fixed location, multimode); high VA CW-only station; high VA mobile; high out-of-state (including DX) station; high VA QRP station; high 4th call area club award; and high out-of-state station. Certificates awarded to winners of VA counties, states, Canadian provinces, and DX countries.

ENTRIES:

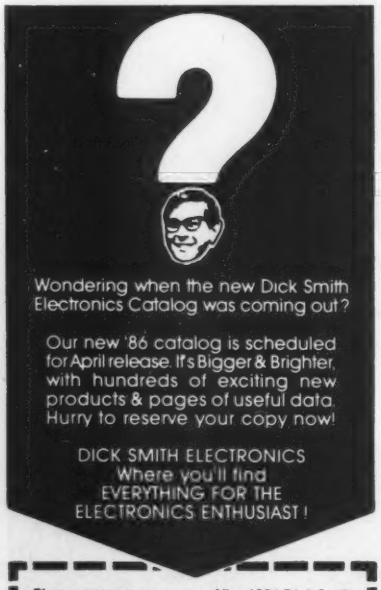
Follow ARRL standard contest guidelines for logs. Indicate each new multiplier as worked and include a summary sheet with your log. Indicate on summary sheet if mobile, QRP, or if entering for CW-only award. Put your name, callsign, complete address, and name of your radio club (if vying for the club award) on the entry forms. Mailing deadline is April 1, 1986, and should be addressed to: Virginia QSO Party, c/o Barry Pybas KW4I, 313 W. Derby Ave., Sterling Park VA 22170.

WISCONSIN QSO PARTY
Starts: 1800 UTC March 9
Ends: 0100 UTC March 10

Use both CW and phone; stations may be worked once per mode on each band. Mobiles may be worked once per mode per county that they operate from. No repeater QSOs allowed! Entry classifications include: single operator, single transmitter; multi-operator, single transmitter; multi-operator, multi-transmitter; single operator, Novice/Technician.

EXCHANGE:

RS(T) and state, province, or WI county.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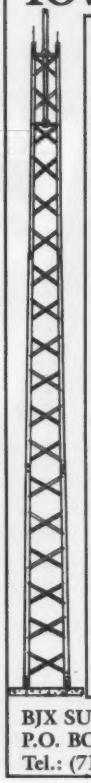

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SCORING:

Phone contacts count 1 QSO point; CW contacts count 2 QSO points, Wisconsin stations multiply QSO points by total number of states, provinces (13 max.), and WI counties. DX countries count for QSO points but not multipliers. Non-WI stations multiply QSO points by number of Wisconsin counties (72 max.). As a bonus, WI mobiles/portables add 500 bonus points for each county that you operate form outside your home county with a minimum of 15 QSOs per county to qualify.

AWARDS:

Awards will be presented to the highest single-operator scores in each state and province. Wisconsin awards to 10 highest single-operator entries plus highest multi-operator single- and multi-transmitter entries, highest Novice/Technician, and highest aggregate club score. Club member stations must be located within 50 miles of the club except for mobiles.

ENTRIES:

All entries must contain a log consisting of: time in UTC, call, RS(T), state, WI county, mode, and a score summary. Summary must include your name, address, and callsign. Circle new multipliers as worked. Logs containing more than 100 QSOs must be accompanied by a dupe sheet (use a separate dupe sheet for each mode). Mobile entries must indicate county changes in log and submit a separate dupe sheet for each county. Entries must be postmarked by April 15 and sent to: Wisconsin QSO Party, c/o West Allis Radio Amateur Club, PO Box 1072, Milwaukee WI 53201.

BERMUDA AMATEUR RADIO CONTEST

Starts: 0001 UTC March 15
Ends: 2400 UTC March 16

This is the 28th year, again sponsored by the Radio Society of Bermuda. The contest is open to all licensed amateurs in Canada, USA, United Kingdom, and the Federal Republic of Germany. Of the 48-hour contest period, your total operating time cannot exceed 36 hours, with off periods clearly logged. Each off period must not be less than three consecutive hours. All stations must be single operator only and must be operating from their own private residence or property. All use bands, 80 through 10 meters. No crossband or crossmode contacts are permitted.

EXCHANGE:

All stations will send RS(T) reports and give the following: Canadians add province, UK stations add county, US stations add state, West German stations add DOK#, Bermuda stations add parish. US and Canadian stations may exchange reports with West German, UK, and Bermuda stations only. UK and West German stations may exchange reports with US, Canadian, and Bermuda stations only. Bermuda stations may work stations in the UK, US, West Germany, and Canada only.

SCORING:

Each completed contact, on each band, counts 5 points. A phone and a CW contact with the same station on the same band will count if they are made at least 30 minutes apart. For all stations outside Bermuda, the multiplier is the total number of Bermuda stations worked on each band. For Bermuda stations, the multiplier is the total number of states, provinces, countries, and DOK# worked on each band. A multiplier may be counted only once per band.

AWARDS:

Printed awards to the top scorer in each state, province, country, and DOK area. The top scorer in Canada, US, UK, and West Germany shall receive a trophy to be awarded at the Society's Annual dinner held in October of each year. Round trip air transportation plus accommodation will be provided to overseas winners to enable them to receive their awards.

ENTRIES:

Logs must show all dates and times in UTC. A separate sheet must be used for each band. All contestants should compute their own scores and check for duplicate contacts. Dupe sheets must be submitted with logs to cover each band where more than 200 contacts are logged. For every duplicate contact for which points are claimed, a penalty or three contacts will be deducted by the contest committee. An excess of claimed duplicates may mean dis-

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qualification. No penalty will be exacted against duplicates for which no points are claimed. Each page must be clearly numbered and marked with contestant's call, year, and band to which it refers. All contestants must sign a statement that they have complied with the rules and terms of their license. All logs must be received by the Contest Committee, Radio Society of Bermuda, Box HM275, Hamilton 5, Bermuda, not later than May 31. Overseas contestants are recommended to forward their logs via air mail. All decisions of the contest committee are final. Bermuda Parish abbreviations are as follows:

SAN—Sandys
PEM—Pembroke
SOU—Southampton
HAM—Hamilton
STG—St. George
DEV—Devonshire
WAR—Warwick
SMI—Smiths
PAG—Paget

YL ISSB QSO PARTY—CW
Starts: 0001 UTC March 15
Ends: 2359 UTC March 16

The contest is open to all amateurs but the emphasis is on member participation and member-to-member contacts. Operating categories include: single operator, DX/WK partners, and YL/OM teams. All bands will be used. VHF and UHF may be used, but all contacts must be direct and not through repeaters. Nets are not allowed!

EXCHANGE:

RST signal report. State, province or county, name; ISSB number (if member), and DX/WK partner's call.

FREQUENCIES:

On HF use the USA General-class band portions. Check 80 and 40 meters on the hour.

SCORING:

Score 3 points for each member contacted on own continent, 6 points if different continent. Non-members contacts count one point regardless of location. Only member station contacts count for multipliers. Multipliers are each US, VK, ZL, and VE state or province, plus each DX county. When DX/WK partners contact each other, it counts as a double multiplier. If your total input is 250 Watts or less during the entire QSO party, then count an additional power multiplier of two. Final score is sum of QSO points times the total multiplier.

AWARDS:

Special certificates will be awarded to the winners of each category. Regular certificates for country, US state, and Canadian province winners.

ENTRIES:

Logs must show date/time (UTC), station QSOed, RST, mode, band, SSBer number, state/province/country, and period of rest time. Summary sheets show states, Canadian provinces, countries, YL/OM teams, DX/WK teams, and partner contacts. Send logs and summary sheets to Bill Early WA9AWA, PO Box 401, McHenry IL 60050-0401, prior to April 30. Be sure to indicate who your DX/WK partner is!

RIO CW DX PARTY
Starts: 1500 UTC March 29
Ends: 1500 UTC March 30

Sponsored by the Pica-Pau Carioca (Rio Woodpeckers CW Group), PO Box 2673, 20001 Rio de Janeiro, RJ, Brazil—with the cooperation of all other Brazilian CW groups. The purpose is to promote 2-way CW contacts between Brazilian and DX stations, enabling DX stations to obtain QSLs valid for several Brazilian Awards. The event is held twice each year on the last full weekend in March and the second full weekend in October.

The general call is "CQ RIO DX PTY." Use all HF amateur bands within your own station license authority. Exchange RST, name, and QTH. There are no logs, but quick QSLing (via bureau or direct) is essential.

Reference frequencies are as follows: 3.510/3.520, 7.020/7.030, 14.030/14.050, 21.030/21.050, 21.130/21.150, 28.030/28.050.

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RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
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You know, sometimes it occurs to me that month after month I have been asking you for input on what you all consider important RTTY topics. I get quite a kick out of your letters and try to answer every one of them. What I have failed to do, however, is let the rest of you in on what your vocal (prolific) buddies have been saying.

One of you, who shall remain nameless for reasons that will become obvious, writes that he has "obtained" a copy of Clay Abrams' RTTY program, detailed here last month, and wonders where he might obtain instructions for the program. Well, if you did not receive instructions with the copy you obtained, I will assume you obtained a "bootleg" copy, that is, one made for you by a buddy, and not bought from Clay. You see, that's the problem. The number of copies circulating is so many more than the number of copies sold that Clay decided that staying in the CoCo software line was more an act of charity than business, so he left.

If you or anyone else who wants full data on the Abrams program has a sudden attack of conscience, you might drop Clay a note at Clay Abrams Software, 1758 Comstock Lane, San Jose CA 95124. Explain your situation to him and see what he says. Of course, I am sure he would be happy to hear from those of you who do not yet own a copy of the program, and who would like to buy a copy.

Congrats to Patrick Spinler KA0UBM, a new Novice licensee out in Blooming Prairie MN. Patrick is an Apple buff who would like to take a shot at writing a RTTY program for the Apple that would have all the features a ham would want. Patrick wants to know what features we would like to see in an "ideal" program. Well, folks, shall we inundate him? No, seriously, Patrick, read along with this column over the last few, and coming, months, and I think you will get the ideas you are looking for. And when you get it together, let me know, so we can share it with the multitudes, okay?

Dave Machlitt, a consulting entomologist (I wonder if he is good at debugging programs) in Ventura CA passes along the newsletter of his local computer club. With quite a bit ofinterest in both the CoCo and C-64 computers evident, it looks like activity with these "low-end" machines continues unabated. Thanks for the information, Dave.

Speaking of C-64s, Richard W. Keusink K7VPL lets us know that several of the items he has bought after reading about them here in "RTTY Loop" have turned out quite well, particularly some of the AEA gear. He has some specific questions, however, which I cannot find answers to, so I will throw them out to you. He asks, "On bringing up the AEA CP-1 program, must I boot it up every time to get the separate QSO buffer; one of the nine message buffers? Can't I bring them all up at the same time? What good is my 1541 (disk drive)? Maybe I'm not storing the material correctly? I also can't load a message port to put in a guy's call without leaving the TR mode. Other hams do it. How do I do it? If I leave the TR mode, of course, I lose all the print. There must be some way to achieve this."

Well, gang, any answers? Drop them to me at the above address, and put "CP-1 Help" on the outside of the envelope so I'll be able to forward the material promptly.

Richard is also interested in locating press wireless signals, such as AP or UPI, on the HF bands. One of the problems you will have in finding press signals for domestic consumption is the relocation of many of these signals to non-HF modes of transmission. International signals should be readable, however, and with that window on the Pacific you have from up there in the Northwest, you should have pretty good luck. Check any of the books mentioned here over the last few months for some likely frequencies, Richard.

Regards to J.R. Mongrain, of Orange MA who is a TI-99/4A user. I hope that the material presented here a few months back regarding RTTY programs for the TI was of use to use to you, and I am happy to send along the material you requested.

Thanks for the kind words from Pam KB6DKZ in Saratoga CA. I

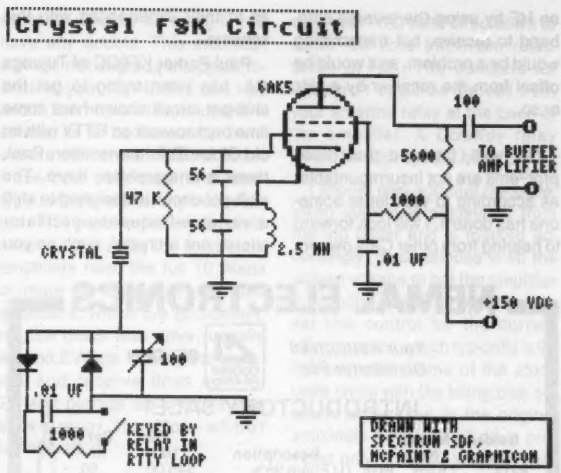

Fig. 1.

glad you find this column as useful as I hope it is, and will continue to try to answer all your questions.

Glenn Farnsworth K2EHM—Howdy Do! As another Apple user, I hope you have not been discouraged in your attempts to get onto RTTY. Again, I hope the material I sent along will provide some aid, and I hope to see you on the air real soon.

Let's see who else I can find in the file. Tom Dillon WJ6M of Los Gatos CA—thanks for the comments and I hope you are doing well on RTTY. Jim Conrad from Odessa TX—my best to you as well. Hope your VIC is RTTYing by this time. If he's not looking, I'll even pass along regards to fellow *73* Associate Editor Bill Gosney KE7C, who has been known to read this column now and then. Bill runs a mean award program, folks. When you finish this issue, why not flip to page 64 of the January, 1986, issue and take a look?

Commodore owners, listen up. I need your help. I have a letter here from Jeff A. Bordeaux which asks some questions I have not seen addressed before, and maybe one of you has the answer. He says that he has been told that, "amateur RTTY communications can be demodulated with a standard Bell type 103 modem used for telephones. Basically, you are supposed to program the RS-232 port on the Commodore-64 for 50-baud operation, five data bits, and modify prescaler values to receive at 45.45, 50, or practically any baud rate. A simple translater program derives ASCII characters off of the five-bit Baudot patterns.

"The method doesn't seem to work for me. Maybe the 200-Hz shift is too narrow for most of the RTTY signals here; maybe the receive frequency tolerance in my 1650 Automodem is too small, etc. I wonder if you may have had contact with someone who has tried this and succeeded.

"In any case, I would like to use a more versatile, but cheap method. I have heard that it is possible to demodulate practically any baud rate, shift, or bit pattern by simply strapping a diode to the Commodore user port and connecting it to the shortwave in some fashion. The method is supposed to use a high amount of software overhead (machine language), but I don't mind."

Well, Jeff, first off, I have problems using a Bell-type modem to receive RTTY, if only because of the tone pairs used. Whereas RTTY uses a 2125-Hz mark and either a 2295 Hz space (for 170-Hz shift) or 2975 Hz space (for 850-Hz shift), I will concede that these frequencies are not sacred, and that by judicious adjusting of the receiver bfo any two frequencies separated by 170 Hz (or 850 Hz) should be obtainable.

Contrast that with the standard tone pairs used on 300-baud modem (Bell type 103) circuits. For the usual operator, operating in the "originate" mode, transmit tones are at 1270-Hz mark and 1070-Hz space; receive tones are 2225-Hz mark and 2025-Hz space. Now, granted that the difference is 200 Hz, "only" 30 Hz away from the 170-Hz RTTY standard, but there is a bigger problem. The mark and space are reversed. This could be corrected

on HF by using the reverse sideband to receive, but transmitting would be a problem, as it would be offset from the receiver by a kHz or so.

Oh, well, I take it that these problems are not insurmountable, as according to your letter someone has done it. I will look forward to hearing from other C-64 owners as to their experiences with this scheme.

Paul Parker KF6OC of Tujunga CA has been trying to get the shift-pot circuit shown here some time back to work on RTTY with an old Globe Chief transmitter. Paul, there is one problem there. The shift-pot circuit is designed to shift a variable-frequency-oscillator circuit, not a crystal, such as you are using in the Globe. My experience, and I used a Globe Chief many years ago, is that shifting a crystal is difficult at best and cannot always be done. If you want to use the shift-pot circuit, you might do well to see if you can't pick up an older outboard vfo for the transmitter. There should be quite a few at the next hamfest you go to, often under $100 (or even less), which will do very well. And going by that old saw, if it's stable enough for SSB, it should be fine for RTTY.

Now, if shifting a crystal is the only way you have to go, you might try the circuit shown in Fig. 1. This vintage circuit will go well with the vintage transmitter you are using and is one way of shifting a crystal. In case you are curious, this circuit is at least twenty-five years old, as you can tell by the specified tube. At any rate, it might serve as a starting point for putting that Globe onto RTTY. Key the circuit through a set of cold contacts activated by your loop, either from the output of the terminal unit or with a reed relay in series with the loop. Layout is important, by the way. Try to keep the crystal and associated wiring as short and point-to-point as possible. Let me know how things go.

By the way, for those who follow such things, the diagram in Fig. 1 was drawn on my little old CoCo, using the Schematic Drafting Processor mentioned here a few months ago, available from Spectrum Projects. The diagram was then cleaned up with McPaint, a public-domain graphics program available in the download menu of the CompuServe CoCoSIG, and lettering put in with Graphicom, by Cheshire Cat, also available from Spectrum. Just shows to go you what a small system can do! Take that, Big Blue.

I have enjoyed chatting with many of you on CompuServe's HamNet. While packet radio is by far the leading topic expressed on the keys, many of you apparently are still interested in more "traditional" RTTY. The only problem is that the loudest group is the vanguard into new areas, while those of you still using Model 15s just go quietly along. Let me hear from all of you, by any means. I have been told that Murray RTTY is dead—do you think that is true? We heard that CW was dead, that AM was dead, that SSB was dead, and so on. It seems to be a popular pastime, declaring this or that phase of the hobby moribund. I don't know, maybe it's my profession, but I am not quite so willing to pull the plug. Are you?

As always, I welcome your comments, questions, barbs, and plaudits. Let me hear from you in the mail to the above address or on CompuServe EasyPlex, HamNet, or CoCoSIG. (Did you ever notice how they like to Double-Capitalize words?) That all important number is 75036,2501. In the mill for coming months will be columns on the Model 33 teletype SREGTR teleprinter, as well as a look at MacPrograms (sorry, couldn't help myself) that are available for MacRTTY (grin). More and more, you just never know what you are likely to find in "RTTY Loop."

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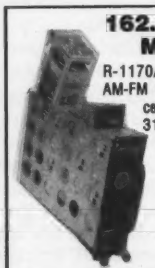

R-1170/ARR-52A 162.5-173.5 MHz AM-FM video solid-state sonobuoy receiver has five plug-in modules and 31 crystal-controlled channels. Conversion possible for 2-meters, VHF weather, satellite TV. (See 10/74 CQ Mag.) Requires 18 VDC; 7.5 x 2.5 x 10, 9 lbs sh.
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ABOVE AND BEYOND

Peter H. Putman KT2B
84 Burnham Road
Morris Plains NJ 07950

The author welcomes inquiries and comments but regrets that he cannot take telephone calls. Please put your inquiries, comments, and submissions in writing. Thank you for your cooperation.

Continuing our discussions from last month on transverters: Several readers have written regarding the low output from the transverter jack on ICOM series radios. Here are simple modifications that will yield about 10–15-dB increase in drive level at 28 MHz on both the ICOM 740- and 745-series radios. You'll need a Phillips screwdriver, soldering iron, wire strippers/cutters, and a short length of RG-174 coaxial cable.

First, remove the top and bottom covers on either radio. Then, locate the six screws that hold the back panel on, remove them, and gently slide the panel away so as not to pull out the nylon multi-pin connectors. Don't pull too hard or you might tear a wire loose from one of those connectors.

IC-740 owners first: On the back panel is a series of RCA-type phono jacks. One jack has nothing connected to it and is labeled SPARE. Locate the connection to the input of the FINAL board. This cable comes from J8 on the RF board and is marked TRF. Desolder this connection from the FINAL board. Now, desolder and tape off the cable to the XVRTR jack as you won't need it. Locate and resolder the cable from J8-TRF to the XVRTR jack, as this will now be your 28-MHz-drive source. Finally, prepare a short 3-inch jumper of RG-174 to be soldered from the SPARE jack to the input to the FINAL board. You'll also need to make up a short 2-inch RCA-male-to-RCA-male jumper with RG-174.

This completes the modification. You no longer need to tie pin 11 of J13 high with +8 volts to enable the transverter jack. However, you must reconfigure the radio for either transverter operation or conventional HF operation, by the way you connect the rear-panel RCA jacks. With a standard transverter, you need to make connections for 28-MHz i-f to the XVRTR and RCVR IN jacks. For regular HF operation, connect XVRTR to SPARE and RCVR IN to RCVR OUT. The bonus is that you will have more than enough drive to make full power with your particular transverter.

IC-745 owners next: Locate the cable from the RF board to the final amplifier. *Caution*: Don't get it confused with the cable from the filter board! Otherwise, you could wind up putting 90 Watts into your transverter input. Locate the rear-panel RCA-jack cluster. Unlike the IC-740, there is no SPARE jack available on the 745 (unless you want to drill a hole and mount one), so you'll have to make a big decision: Do you need the LOW BAND ANT jack? This connection comes into play when the dial is set below 1.5 MHz for a separate longwire antenna or whatever you would use on those frequencies. In the case of the two mods I performed locally, neither ham expressed any interest in this jack. If that is the case for you, then remove the coax from this jack and tape it off.

Next, remove the coax from the XVRTR jack and also tape it off. Locate the output from J10/TRF from the RF board, and reroute it to this jack and solder. Next, make up about 12 inches of RG-174 and run it from LOW BAND ANT jack back to the input of the FINAL board. Inspect your connections and make sure you haven't pulled any nylon connectors loose from the filter board. Replace the back panel and the covers. Finally, make up a short (2-inch) RCA-to-RCA plug jumper for the rear panel. The configuration is the same as for IC-740 users: 28-MHz i-f connections for your transverter go to XVRTR on transmit and RCVR IN on receive. For HF operation, jumper RCVR IN and RCVR OUT together as well as XVRTR and low band ant.

By the way, this modification resulted in 10+ Watts output from a Microwave Modules MMT 144/28 when used with an IC-745. Previous to this, the output was about 1 Watt. So the modification works very well! One additional note: When you make such modifications to your radio you void the warranty. This is standard practice of all ham equipment manufacturers. It's no big deal, really. Just wait until your unit is out of warranty (usually 90 days) if you have any doubts. This modification will not degrade the performance of your IC-740/745 one iota and in fact makes it more useful—at least as far as transverter owners are concerned. Case in point: I use both solid-state and tube-type amplifiers after my transverters. The problem of drive levels arises in that while the solid-state amplifiers need the full 10 Watts or more for full power, the tube amplifiers, which are grid-driven, require much less drive, usually around 2 Watts. Having the transmit and receive lines split at 28 MHz permits the use of a step attenuator to allow either configuration.

My apologies to all who were puzzled by some typos in the December, 1985, column about the AM-6155 amplifiers. First of all, the optional bias circuit came out of left field. Not only did the zener position get reversed, but also the adjustable pot was left out of the circuit and the text specifies the wrong value for the series resistor. Whew! Let's try it again.

Fig. 1 shows the circuit as it should have appeared. This circuit is not new and has been used in many amplifiers. It has even appeared in the *ARRL Handbook*. I have printed it here in case you wish to control the standby and idling-bias current for the 8930 tube used in the AM-6155 in a safe, reliable manner. The suggested mods for AF1T break the screen-voltage line to cut off plate current. Either way will work. Incidentally, the value of the zener is not critical. I've used anywhere from 33 volts up to 56 volts, but it should be about 5 Watts to be safe. The 5000-Ohm, 2-Watt potentiometer is a fairly common item.

If you go for the optional bias circuit, test it by grounding J1 with the plate voltage off and measure the voltage at the grid. It should vary from -130 volts or so down to about -56 volts (minimum resistance of R2). The contacts for closing J1 could be derived from your antenna relay at the back of the amplifier. A DowKey relay would be appropriate here.

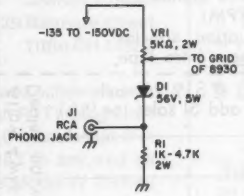

Fig. 1. The optional bias circuit as it should have appeared in December's column on AM-6155 amplifiers.

I should also add that the plate-idling current is adjustable from the top cover and is marked accordingly. If you choose to lift the screen voltage to put the amplifier in standby, then you need only to set this control for the correct idling current, which typically is 90 milliamperes. Some of the stock units come with the idling bias set much higher, but in the original amplifiers 10 Watts of drive provided only 50 to 60 Watts of output—largely due to the input circuit being severely undercoupled to the grid of the 8930 tube. My guess is that the units were set to draw almost 150 mA of idling current, since two that I have seen exhibited this condition before they were modified. However, the listed modifications make the amplifier much more efficient, since much less drive is required to provide equivalent output.

One last correction: The 3.3-pF input capacitor should be shunted with 18–20 pF of capacitance, not the input-tuning capacitor, as the text says. Please follow the schematic for the correct modification. Despite these errors, you'll find the conversion of the AM-6155 to 220 MHz rewarding and the time well spent.

Want to put the unit on 144 MHz? (Boy, have I gotten a lot of inquiries on this one!) Here's the data compiled from Dale AF1T and Woody Peltzer AK2F: First, refer to Fig. 2. Locate C1, the 1.8-pF input-coupling capacitor. This needs to be shunted with 7–20 pF of capacitance. You'll have to experiment with the value. Use silver mica 250-volt capacitors where possible, not disc ceramics. Next, locate C2, the 30-pF input-tuning capacitor. This needs to be shunted with 20–30 pF of capacitance. Again, you'll have to try different values. Finally, C3, the 3.3-pF capacitor to the grid of the 8930, needs to be shunted with about 100 pF of capacitance. This value appears to be constant from amplifier to amplifier.

The last thing you'll need to do is locate the plunger assembly marked VHF-UHF. The AM-6155 comes set up for UHF operation, so follow the arrow direction and change the cavity plunger accordingly. This shaft has a slide lock on

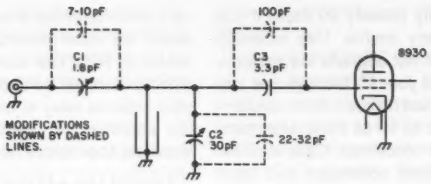

Fig. 2. Modifications necessary for putting 144 MHz on your AM-6155 amplifier.

it to prevent accidental movement. Changing the plunger changes the resonance of the cavity and puts it in the 120–160-MHz range, and setting the turns counter on the output tuning to about 050 to 070 may get you in the ball park quickly when initially tuning up.

One technique that I used when tuning up an AM-6155 for the first time was to bring up the filament and grid voltages, but no plate or screen. Next, I applied a driving source to the input of about 1 Watt and connected a sensitive rf millivoltmeter to the rf output jack. Using this combination, I was able to tune the amplifier for maximum output quite readily. After disconnecting the rf millivoltmeter and connecting a dummy load, it was a simple matter to peak the four controls quickly for maximum output. It also saved a sprained wrist from having to dial away at the slow-turning counter.

Update: Now that I've given the data for the AM-6155 conversion, Fair Radio has gone and sold out all the units they had. Well! Guess I'll just have to mention that they *do* have about a hundred of the AM-6154 VHF cavity amplifier assemblies in stock for about another 50 dollars. These are already tuned for 120–160 MHz but still need additional mods to the input circuit to increase the coupling at 144 MHz. The critical component there would be C3, and this probably needs to be brought up to about 100-pF capacitance as is the case with the AM-6155 model. I'd appreciate any correspondence from readers (no phone calls, please) who've successfully put these on two meters.

It goes without saying, I guess, that the AM-6154 can be converted up to 200 MHz. You'll need to set the plunger assembly to the UHF position, as indicated by the arrows on the cavity shell. The next step would be to modify the input circuit as per the December article. Again, conversion data from those who've pulled a 6154 up to 220 MHz would be greatly appreciated, and I'll publish it here as soon as I receive same.

One last note regarding Fair Radio: In the recent fall/winter supplement is the #A5–TUN–CAV, which is nothing more than a tunable VHF/UHF cavity using a 4CX250B and 6818 driver tube. No power supply is included. Originally part of an FAA TV-36/TU-9, 50-Watt-transmitter assembly (shades of the AM-6155), the unit comes complete with tubes for about $95. The cavity is silver plated with three tuning controls, including one with a turns counter in it like the 6155.

If you're handy, you can build a power supply for this unit and will need to supply the following voltages: +2000 V dc, +300 V dc, 6.0 volts ac for the filaments, and -135 volts adjustable for the bias. You won't need to use the 6818 tube, but the input circuit is probably undercoupled as in the AM-6155 and 6154. Some modification of the input circuit should result in an amplifier capable of 300–400 Watts output with 3–4-Watts drive in Class AB_1. The bias circuit in Fig. 1 could be used here. The nice thing about this amplifier is that 4CX250Bs are relatively cheap and plentiful at hamfests. I recently bought two that looked brand-new (and worked that way) for a total of $10.

Again, any conversion data is solicited from readers. I might even order one of these myself and fool around with it. The UHF capability suggests possible use on 220 MHz as well. As you can see, there's a lot of surplus out there that can be put to use right away by the VHF enthusiast. Incidentally, I published the address before, but I'll do it again for Fair Radio: 1016 E. Eureka Street, PO Box 1105, Lima OH 45802.

An interesting publication has crossed my desk. It's *VHF Communications*, which is published four times a year in Germany and contains many useful articles, some of which pertain to construction projects. The late Terry Bittan G3JVQ/DJ0BQ was its publisher until his death in early 1985; I'm not sure who is putting the magazine out at this time. This particular issue featured articles on building your own MeteoSat converter for receiving weather pictures from space, as well as a fast-scan TV converter to display them. Also mentioned were projects for a 2–200-MHz wattmeter, compact BNC attenuators using chip resistors, and a 2.3-GHz prescaler for frequency counters.

Most of these articles referenced a listing at the back of the magazine for parts and assembled units. Several of the kits are offered directly through *VHF Communications* by mail order. The articles are well-written and the layout features clean schematics, as well as parts overlays and PC-board templates. The only catch is that many of the parts used are European in origin and finding them here is a bit of a bother. Regardless, the magazine makes for interesting reading. *VHF Communications* is available in the US from U.V. Comms, PO Box 432, Lanham MD 20706. I didn't find a subscription rate but it would appear to be around $17 per year based on the DM-to-dollar conversion.

By the time you read this, the ARRL VHF Sweepstakes will have come and gone, but I hope that many of you took a little time and got on the air to make a few QSOs. This is by far the largest VHF contest (well, what else is there to do in January?) and draws several hundred entries. One good thing about contests is that they lead to increased activity on many quiet bands, such as 220 and 1296 MHz. It's also a great time to make a performance check of your station equipment. I've aligned many a preamplifier, converter, and transverter during a contest (sometimes when I didn't plan on it). There sure are a lot of weak signals to choose from.

Missed the VHF SS? There's the ARRL Spring Sprints which start in April. These basically are a series of monoband one-night contests with 4-hour periods, hence the name "sprint." Details are available in *QST*. Again, these are fun ways to spend an evening, really finding out just how much activity is around on your favorite band.

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Not much further down the road lies the ARRL June VHF QSO Party, the first of the big four summer contests. This is the second most popular VHF contest with many stations traipsing around to various hilltops and grid squares to give out points.

Close on its heels is the *CQ* Worldwide VHF WPX contest in July. The WPX ran for the first time last July and received an astounding 460+ entries from all over the globe. This is the only contest that uses prefixes (WB2, DL0, JH1, G3, VE4, etc.) for multipliers and has met with very enthusiastic response. I am co-chairman of the *CQ* VHF WPX Contest Committee with Steve Katz WB2IK of *CQ* magazine and will mention from time to time some of the more interesting scores and stories from this event.

Bringing up the rear are the ARRL UHF Contest in August and the ARRL September VHF QSO Party. The latter is often noted for its wild tropo openings, such as in 1984 when the Massachusetts-to-Georgia path was worked on 1296 MHz! So, you can see that there are plenty of opportunities to "exercise" your station and have fun doing it as well.

Although VHF and UHF contesters are every bit as serious as HF contesters (maybe even more), the bands are never as hectic and with Sporadic-E, Aurora, Meteor Scatter, and Tropo Scatter awaiting you there are plenty of surprises. Just wait until about five years from now when the sunspot cycle is on the way up and you start hearing G3s coming through your speaker! (Not to mention LU, YV, XE, VP, and possibly DL/F/EA and other Europeans as well.)

This might be a good time to shop around for a used 50-MHz rig, such as the ICOM IC-551 and 551D series. Many of these are showing up at flea markets since their owners have lost interest with the declining sunspot cycle. For those who don't know, the IC-551 is a 10-Watt multimode with built-in power supply, while the 551D runs 80-Watts output and requires a separate supply. Unlike most multimode radios, they were designed for SSB/CW operation, with FM an add-on. The receiver performance is most satisfactory, although it can be improved considerably with a good MOSFET preamplifier.

Update #2: Late word from Ivars Lauzums KC2PX brings the news that hams in Great Britain have been granted 50-MHz privileges—the first step, hopefully, to wide-scale 6-meter operation on the European continent.

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards or odd-sized scraps of paper. Please type or print your request (neatly!, double-spaced, on an 8-1/2 x 11 sheet of paper and use upper- and lowercase letters where appropriate). Also, please make a 1 look like a 1 not an l—which could be an el or an eye, and so on. Hard as it may be to believe, we are not familiar with every piece of equipment ever manufactured on Earth! Thanks for your cooperation.

I am looking for a manual for a National NC-183D general-coverage shortwave receiver.

Several years ago I was referred to a place in Missouri which carried manuals and schematics for older equipment. Does anyone have the name and address of this or of any place that would have them?

Lawrence W. Joy NO0S
586 Fremont Drive
Littleton CO 80120

I would like to locate a Johnson model #122 vfo and a Johnson #6N2 vfo.

Joseph Karr N9FAU
3800 Cheyenne Avenue
Racine WI 53404

If anyone has a copy (in good condition) of the book, *The Complete Handbook of Slow-Scan TV*, by Dave Ingram K4TWJ (Tab Book No. 859) and wants to sell it, please write and tell me your price. I will pay in advance.

Carlos Urbina Pacheco
Calle 14 No. 1128 Norte
Torreon, Coahuila 27000
Mexico

I need the manual or schematic and alignment procedures for a John Fluke differential voltmeter, model 803D/AG. I will pay postage and copying costs. Please write before sending any material.

Robert P. Whitted DA2EB
PO Box 2567
APO NY 09123

A ham radio/computer club wishes someone to donate a working or non-working disk drive for use in the club. The drive needed is for either a Radio Shack TRS-80-II color computer or an Atari 800XL computer.

Howard S. Bacon
213 Holly Avenue
So. Pittsburg TN 37380

I want to start a newsletter on slow-scan TV/radio facsimile/satellite weather photos. Anyone who might wish to write for it should write to me.

Howard S. Bacon
213 Holly Avenue
So. Pittsburg TN 37380

I am looking for support brackets for the AN/URA-17 comparator-converter unit.

Charles T. Huth
229 Melmore Street
Tiffin OH 44883

I need the instructions and schematics for the Macrotronics Terminall RTTY program. I presently have version 2.0 manufactured in 1982. I am also interested in any and all software for RTTY for the Model IV TRS-80 computer.

Dennis D. Watters WB8TAX
HHC, 10th Engineer
Bn.(Combat)
APO New York 09701

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HP-618B SIGNAL GENERATOR 3.8 GHZ TO 7.6 GHZ, 0.1 MV TO 1V INTO 50 OHMS, CALIBRATED OUTPUT, INTERNAL, EXTERNAL PULSE OR FM MODULATION $375.00
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HP620A SIGNAL GENERATOR, 7 GHZ TO 11 GHZ, CALIBRATED OUTPUT INTERNAL, EXTERNAL, PULSE, FM MODULATION $450.00
HP 628A SIGNAL GENERATOR, 10 GHZ TO 15 GHZ INTERNAL, EXTERNAL, PULSE, SQUARE WAVE, FM MODULATION CALIBRATED OUTPUT, 10 MW TO 1 PW $650.00
HP 628A SIGNAL GENERATOR, 15 GHZ TO 21 GHZ, CALIBRATED OUTPUT 10 MW TO 1 PW INTERNAL, EXTERNAL, SQUAREWAVE, PULSE, FM MODULATION $650.00
URM-25 MILITARY SIGNAL GENERATOR, 10 KHZ TO 50 MHZ, RF OUTPUT 0 MV TO 2 VOLTS AM/CW 400/1000 HZ MODULATION, 50 OHM STOP ATTENUATOR, SMALL PORTABLE UNIT $245.00
URM-26 MILITARY SIGNAL GENERATOR, 4 MHZ TO 405 MHZ, CALIBRATED OUTPUT ATTENUATOR 0 MV TO 2 VOLTS, AM/CW 400/1000 HZ MODULATION, SMALL PORTABLE UNIT $245.00
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SPECIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial offices, 73 Magazine, WGE Center, Peterborough, NH 03458-1194.

FORT MYERS FL
MAR 1

The Fort Myers Amateur Radio Club is sponsoring the City of Palms Annual Hamfest, March 1, at the Moose Lodge Hall, 1900 Park Meadow Dr., ½ block off U.S. 41, South Fort Myers. Admission is a $3 donation. Talk-in on 2 meters, 146.28/.88. There will be exhibitors, dealers, and forums on antennas, packet radios, DX. Swap tables are $10.

CHICOPEE MA
MAR 2

The Mount Tom Amateur Repeater Association will hold its annual flea market on March 2, 1986, from 8:00 am to 3:00 pm, at the Knights of Columbus Elder Council 69, Granby Road, Chicopee MA. Admission is $1.00; ladies and children under 12 are free. Tables are $7.00 in advance and $8.00 at the door. For more information, contact MTARA, PO Box 3494, Springfield MA 01101.

WINCHESTER IN
MAR 2

The Randolph Amateur Radio Association will sponsor a hamfest on Sunday, March 2, 1986, from 8:00 am to 5:00 pm, at the Winchester National Guard Armory, Winchester IN. Admission is $3.00 (under 12 free). Spaces are $5.00 with a table and $2.50 without (available by reservation only). Talk-in on 147.90/.30 and 224.90/223.30. For reservations or more information, write RARA, PO Box 162, Winchester IN 47394, or call Jake Life W9VJX at (317)-584-9361 or Herb James WB9UZZ at (317)-584-4995.

CIRCLEVILLE OH
MAR 2

The Teays ARC will sponsor a hamfest on Sunday, March 2, 1986, from 8:00 am to 4:00 pm, at the K of C Building, 2489 North Court Street, Circleville OH. Tickets are $3.00 in advance and $4.00 at the door. Tables are $5.00 in advance and $6.00 at the door. For tickets (send an SASE) or more information, contact Dan Grant W8UCF, 22150 Smith Hulse Road, Circleville OH 43113; (614)-477-3026.

ARMADILLO COUNTY TX
MAR 2–DEC 31

To commemorate Texas' sesquicentennial year, Armadillo County has been created by Governor Mark White. Any ham operating from those highways marked "The Texas Independence Trail" may sign Armadillo County, Texas. The Texas DX Society is planning to operate special-event station K5DX/A on March 2, 1986. Armadillo County has been sanctioned by the USACA. For further information, call Tom Taormina K5RC at (713)-489-1152 or write the Texas DX Society, PO Box 540291, Houston TX 77254-0291.

DALTON GA
MAR 8

The Dalton ARC will hold its annual hamfest on March 8, 1986, at the North Georgia Fairgrounds, Dalton GA. Further information may be obtained from the local HF and VHF nets or by writing the Dalton ARC, PO Box 143, Dalton GA 30722-0143.

MILWAUKEE WI
MAR 8

The Milwaukee School of Engineering ARC (W9HHX) will sponsor its annual hamfest on Saturday, March 8, 1986, from 8:00 am to 2:00 pm, at 1121 North Milwaukee Street, Milwaukee WI. Tickets are $2.00 and 4-foot tables are $3.00. Talk-in on 146.19/.79 and 146.52. For more information, send an SASE to W9HHX Fest, PO Box 644, Room C-6, Milwaukee WI 53201-0644.

STERLING IL
MAR 9

The Sterling-Rock Falls Amateur Radio Society's 26th Annual Hamfest will be held March 9 at the Sterling High School Fieldhouse, 1608 4th Ave., Sterling IL. Doors open at 7:30 am. Tickets are $3 in advance, $4 at the door. Tables requiring electricity and commercial tables are $5; all others $3. Talk-in on 146.25/.85. There will be free parking, and space to accommodate campers. For tickets, tables, or more information, write Sue Peters KA9GNR, PO Box 521, Sterling IL 61081, or call (815)-625-9262.

INDIANAPOLIS IN
MAR 9

The Indiana Hamfest, sponsored by the Morgan County Amateur Radio Association, will be held on March 9, at the Indiana State Fairgrounds Pavilion Building in Indianapolis, Indiana. Admission: $5.00 at the door. Flea-market table: $8.00; space without table: $3.00. All tables must be reserved in advance. Setup will be Sunday, March 9, 6–8 am. No cars inside after 8 am, Sunday. Free paved parking. Talk-in on 145.25. For more information, send an SASE before March 1 to Aileen Scales KC9YA, 3142 Market Place, Bloomington IN 47401, (812)-339-4446.

WHIPPANY NJ
MAR 14

The Splitrock Amateur Radio Association presents its first annual Evening Hamfest on March 14, beginning at 7 pm at the VFW Post 3401, Tabor Road (Rte. 53) in Morris Plains NJ. Admission is $1; sellers' tables $7. For additional information write PO Box 3, Whippany NJ 07981 or K2RF Repeater: 146.385/146.985.

HUDSON NH
MAR 15

The annual Interstate Repeater Society Flea Market will be held March 15 at the Hudson Lions Club, Lions Avenue, Hudson NH from 9 am to 4 pm. Doors will open at 8 am. Admission is $1 and tables are $8. Talk-in on .25/.85 and .52. For further information or advance table reservations, contact Richard Everhart WB8YGR, 25 Briand Dr., Nashua NH 03063, or call (603)-889-3479.

AUBURN NY
MAR 15

The Auburn ARA will hold its annual Winterfest on March 15, 1986, from 9:00 am to 5:00 pm, at the Farm/Home 4H Center, Grant Ave./Route 5, Auburn NY. Admission is $3.00; tables are $5.00. Testing will be available. Talk-in on 147.00. For more information, contact Robert C. Bruno WA2ITJ, 1 Birch Lane, Auburn NY 13021.

MIDLAND TX
MAR 15–16

The Midland ARC will hold its annual St. Patrick's Swapfest on March 15–16, 1986, from 10:00 am to 5:00 pm on Saturday and from 8:00 am to 2:30 pm on Sunday, at the Midland County Exhibit Building, east of Midland TX on the north side of Highway 80. Admission is $5.00 in advance, $6.00 at the door. For more information, contact the Midland ARC, PO Box 4401, Midland TX 79704.

JEFFERSON WI
MAR 16

The Tri-County ARC (W9MBQ) will hold its annual hamfest on Sunday, March 16, 1986, from 8:00 am to 3:00 pm, at the Jefferson County Fairgrounds, Jefferson WI. Tickets are $2.50 in advance and $3.00 at the door. Tables are $3.00 in advance and $4.00 at the door. Exams will be given. Talk-in on 144.89/145.49 and 146.52. For tickets or more information, send an SASE to Bob Barker K9RIJ, 724 Burdick, Milton WI 53563.

VALHALLA NY
MAR 16

The Westchester Emergency Communications Association will hold its second annual hamfest and electronics fair, WECAFEST 86, on Sunday, March 16, 1986, in the cafeteria of the Westchester Community College Student Center, Valhalla NY. Admission is $2.00 (under 16 free). Exams will be given. For more information, write WECAFEST 86, PO Box 348, Millwood NY 10546.

MAUMEE OH
MAR 16

The Toledo Mobile Radio Association, Inc., presents its 31st annual Ham Fest and Computer Show to be held on Sunday, March 16, 1986, at the Lucas County Recreation Center on Key St., Maumee OH. Hours will be from 8 am to 5 pm. Free parking. Tickets are $2.50 in advance; $3.00 at the door. Tables will be available and displays are limited to electronic, amateur, and computer equipment. FCC examinations: Technician through Extra by appointment only. To apply, send a completed form 610, a copy of your present license, a check for $4.25 made out to the ARRL/VEC, and an SASE to Elmer Zieroff KU8B, 2614 106th Street, Toledo OH 43611. Cutoff

date for applications is February 16. Women's activities begin at 11 am. Talk-in frequencies: 147.87/.27. The TMRA repeaters are on 147.87/.27, 447.850/442.850, and 224.140/222.540. There will be refreshments. For further information, contact Joseph Nyitray W8LNV, 3950 Drummond Road, Toledo OH 43613, (419)-472-7935.

CHELSEA MA
MAR 18

Chelsea Civil Defense will sponsor amateur-radio evening classes at Chelsea High School starting March 18 for those interested in obtaining a Novice or basic level ham license, or Technician/General license. A minimal cost will be charged for material only. The classes will be open to all in the local area who have an interest in becoming a ham. For more information write: Frank Masucci, 136 Grove St., Chelsea MA 02150. Include your phone #.

BLACKSBURG VA
MAR 19–21

A workshop entitled Personal Computer Interfacing for Scientific Automation will be held on March 19–21, 1986, in Blacksburg VA. The cost is $495. For more information, contact Dr. Linda Leffel, CEC, Virginia Tech, Blacksburg VA 24061; (703)-961-4848.

SEATTLE WA
MAR 20

Volunteers from several local ARCs will operate KD7WS from the 9th annual Northwest Science Fiction Convention (NORWESCON) in Seattle from 1800Z to 0200Z for four days starting March 20. Demonstrations and speakers to introduce young people to ham radio are also planned. Frequencies: phone—bottom 25 kHz of General phone bands; CW—bottom 30 kHz of General CW and Novice bands; RTTY—7.085, 14.090, 21.090; VHF via 146.96 repeater. Certificate for QSL and SASE via John V. Hedtke KD7WS, 8729 Palatine N., Seattle WA 98103.

MARSHALL MI
MAR 22

The Southern Michigan ARS and the Marshall High Photo-Electronics Club will sponsor the Michigan Crossroads Hamfest on Saturday, March 22, 1986, from 8:00 am to 3:00 pm, at Marshall High School, Marshall MI. Admission is $1.50 in advance and $2.00 at the door. Tables are $.50/ft. Exams will be given. Talk-in on 146.52 and 146.07/.67. For more information or reservations, write SMARS, PO Box 934, Battle Creek MI 49016, or call Wes Chaney N8BDM at (616)-979-3433.

UPPER SADDLE RIVER NJ
MAR 22

The Chestnut Ridge Radio Club will hold the 9th annual Ham Radio Flea Market on Saturday, March 22, 1986, at the education building of the Saddle River Reformed Church, East Saddle River Road and Weiss Road, Upper Saddle River NJ. Tables are $10.00 for the first, $5.00 each additional table. Tailgating: $5.00. Refreshments. For further information, contact Jack Meagher W2EHD, 27 Fourth St., Closter NJ 07624, (201)-768-8360.

MACON GA
MAR 22

The Macon County Amateur Radio Club W4BKM will operate a special-event station live from the Cherry Blossom Festival in Macon GA, March 22, 1986, from 10 am to 5 pm EST. Frequencies will be phone, 14.237 and CW, 7.137. For a Cherry Blossom Certificate, please send a large SASE to Mona Witherington N4MPR, 2898 Williamson Drive, Lizella GA 31052.

ELIZABETHTOWN KY
MAR 22

The Lincoln Trail Amateur Radio Club will sponsor the 1986 Elizabethtown Hamfest on March 22, 1986, at the Prichard Community Center in Elizabethtown KY. Talk-in on 146.38/.98. For more information, contact Hubert Hensley WD4GDA, PO Box 387, Vine Grove KY 40175, or call (502)-877-2234.

HERMITAGE PA
MAR 22

The Mercer County Amateur Radio Club welcomes amateurs to socialize and exchange views at its "How To" seminar on March 22 from 9 am to 4:30 pm at the Hermitage Middle School, opposite Shenango Valley Mall on Rt. 18 in Hermitage PA. Topics will be presented on development of ham-shack skills. License examinations (Novice through Extra class) will be given. Examinees and those under 18 will be admitted free; all others $2. Talk-in on 147.75/.15. SASE to MCARC, Box 996, Sharon PA 16146 for details.

EGG HARBOR CITY NJ
MAR 22

Shore Points ARC invites everyone to Springfest '86, Saturday, March 22, from 9 am to 2 pm at the Atlantic County 4-H Center, Egg Harbor City NJ (15 miles west of Atlantic City).Limited ac in indoor space. Sellers $5 per space (bring your own table); buyers $2.50 advance, $3 day of hamfest. Talk-in on 146.985 and .52. For more information, write: SPARC, PO Box 142, Absecon NJ 08201.

COLUMBUS GA
MAR 22–23

The Columbus GA ARC will sponsor a Hamfest Saturday on March 22 from 9 am to 5 pm and Sunday from 9 am to 3:30 pm at the Columbus Municipal Auditorium. Indoor tables are $6.50 per day. Contact Joe Mills at (404)-687-3050 or write CARC, PO Box 6336, Columbus GA 31906 for table rentals. FCC exams will be given Saturday at 9 am at the Colonial Inn. Talk-in is on 146.01/.61. For more information call Billy Bedgood at (404)-323-5579 or Bill Haycock at (404)-327-7345, or write CARC.

MADISON OH
MAR 23

The Lake County ARA will sponsor the eighth annual Lake County Hamfest/Computerfest on March 23, 1986, beginning at 8:00 am, at Madison High School, Burns Road at Middle Ridge Road, Madison OH. Admission is $3.00 in advance and $4.00 at the door. 6-foot tables are $5.00; 8-foot tables are $6.50. Exams will be given. Talk-in on 147.81/.21. For more information, send an SASE to LCARA Hamfest, 5261 Harmony Lane, Willoughby OH 44094, or call (216)-953-9784.

GRAYSLAKE IL
MAR 23

The Libertyville and Mundelein ARS will sponsor LAMARSFEST 86 on Sunday March 23, 1986, from 8:00 am to 2:00 pm, at the Lake County Fairgrounds, Grayslake IL. Admission is $2.00 in advance and $3.00 at the door. Tables are $5.00 each. Talk-in on 147.63/.03 and 146.52. For information or reservations, write Marc Abramson, PO Box 633D, Wheeling IL 60090.

TRENTON NJ
MAR 23

The Delaware Valley Radio Association will hold its 14th annual amateur-radio and computer flea market on Sunday March 23, 1986, from 8:00 am to 2:00 pm, at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, Lawrence Township, Trenton NJ. Admission is $3.00 in advance and $4.00 at the door. Flea-market spaces are $5.00 ($7.00 for wall spaces). Sellers must provide tables. Talk-in on 146.07/.67. For advance registration or more information, send an SASE to KB2ZY, Box 441B, RD #1, Stockton NJ 08559.

TIMONIUM MD
APR 6

The Baltimore Amateur Radio Club will present the 1986 Greater Baltimore Hamboree and Computerfest on April 6 at the Maryland State Fairgrounds Exhibition Complex at Timonium MD. Gates open at 8 am. The fairgrounds are located east of I-83 exit 17, three miles north of I-695, just north of Baltimore. Admission is $4, children under 12 free. For further information, contact: G B H & C, PO Box 95, Timonium MD 21093-0095, or call (301)-561-1282. For a recorded announcement, dial: (301)-HAM-TALK.

MADISON WI
APR 6

The Madison Area Repeater Association will hold its 14th annual Madison Swapfest on Sunday, April 6, at the Dane County Exposition Center Forum Building in Madison WI. Doors will open at 7:30 am for flea-market sellers and at 8 am for the public. Admission is $2.50 in advance and $3 at the door. Flea-market tables are $5 in advance and $6 at the door. Talk-in will be on the M.A.R.A. repeater, WB9AER/R, 146.16/.76. For more information, write: M.A.R.A., PO Box 3403, Madison WI 53704, or call (608)-222-4744, day or night.

OLD BRIDGE NJ
APR 6

The Old Bridge Amateur Radio Association will hold an indoor/outdoor Electronics Flea Market, April 6, at the Knights of Columbus Hall in Old Bridge. The hall is located on Pine Street off Rt. 18 in Old Bridge. Talk-in frequencies are 147.120+600 and 146.520. Admission will be charged and a door prize will be awarded. Sellers may register by mail. Send SASE for details to Bob Navin, 106

Madison Ave., Old Bridge NJ 08857.

GROSSE POINTE MI
APR 6

The South Eastern Michigan Amateur Radio Association (SEMARA) will hold its 28th annual Hamfest Swap and Shop at the Grosse Pointe North High School, 707 Vernier Road, Grosse Pointe Woods MI, from 8:00 am to 3:00 pm. The Hamfest will feature an ARRL forum, DX forum, and a RTTY forum. Advance tickets $1.00, at the door, $3.00. Advance tables $8.00, at the door, $10.00. Talk-in on 147.75/.15 and 146.52. For more information, write to SEMARA Hamfest, PO Box 646, St. Clair Shores MI 48080, or phone Fred Lewis NK8M at (313)-881-0187.

SULLIVAN IL
APR 20

The Moultrie Amateur Radio Klub (MARK) hamfest, formerly held at Sullivan IL, will be held Sunday, April 20, from 8 am to 3 pm at the Coles County Airport, located between Mattoon and Charles IL on Rt. 16. The hamfest will be in a large, heated hangar. Admission is $2 advance, $3 at door. No extra charge for vendors, but bring tables. Talk-in on 146.655/146.055 or 146.52. Further information, write MARK, PO Box 79, Sullivan IL 61951, or call Vernon Jack K9SWY at (217)-728-7596.

DAYTON OH
APR 25

The Miami Valley FM Association will sponsor the 17th annual B*A*S*H, on Friday night of the Hamvention, April 25, at 7 pm in the Conference Center at the Hara Arena and Exhibition Center, Dayton, Ohio. There is no admission charge.

DAYTON OH
APR 25–27

The Dayton Amateur Radio Association, Inc., will sponsor the Dayton Hamvention on April 25–27, 1986, at the Hara Arena and Exhibition Center, Dayton OH. Admission, valid for all three days, is $8.00 in advance, $10.00 at the door. Banquet tickets: $14.00 in advance, $16.00 at the door *if available.* Ladies luncheon, $6.75. Advance sale deadlines: April 5 (Canada) and April 12 (USA). Roy Neal K6DUE will be the banquet speaker.

Giant Flea Market: noon Friday through Sunday. *All spaces sold out.*

Technical forums on: personal computer, packet radio, ARRL, AMSAT, antennas, RTTY, SSTV/ATV, FCC, electrical safety, and other topics. CW Awards—try to break the 72.5-wpm world record!

License exams: Novice through Extra, by reservation only. Send before March 29: completed form 610, a copy of your present license, and check or money order for $4.25 payable to ARRL/VEC, to: License Exam, Attn. Tom Holmes, 8830 Windbluff Pt., Dayton OH 45459.

Send nominations for "Radio Amateur of the Year," "Special Achievement," and/or "Technical Achievement" Awards, to Awards Chairman, Box 44, Dayton OH 45401, before April 1.

For further information, see HAMVENTION ad on page 15.

FITCHBURG MA
APR 26

The Montachusett Amateur Radio Association will hold Flea Market Saturday, April 26 at the Knights of Columbus Hall on Electric Avenue, Fitchburg MA. Doors open at 8 am for sellers and 9:30 am to 3 pm for buyers. Talk-in on 144.85/145.45 and 146.52. Admission is $1; tables $8 each. For table reservations send check payable to M.A.R.A., c/o James Beauregard, 7 Mountain Ave., Fitchburg MA 01420.

CEDARBURG WI
MAY 3

The Ozaukee Radio Club, Inc., will sponsor its 8th annual Cedarburg Swapfest on Saturday, May 3, from 8 am to 1 pm at the Circle B Recreation Center, Highway 60 and County I, in Cedarburg WI (20 miles north of Milwaukee). Admission is $2 in advance, $3 at the door. Four-foot tables are $3 each. Sellers will be admitted at 7 am for setup. For more information, send a business size SASE to 1986 ORC SWAPFEST, 101 E. Clay St., Saukville WI 53080.

GRAND JUNCTION CO
MAY 10

The Grand Mesa Repeater Society will hold the Seventh Annual Western Slope Amateur Radio and Computer Swapfest on Saturday, May 10, 1986, from 9:00 am to 4:00 pm at the National Guard Armory, 482-28 Road, Grand Junction CO. Admission is free and swap tables are $5.00 each. Features will include an indoor swapfest, amateur radio exams, a packet radio demonstration, an auction, and refreshments. Talk-in on 146.82 and 449.20. To reserve a swap table and for further information, send an SASE to Larry S. Brooks WBØECV, 3185 Bunting Ave., Grand Junction CO 81504, or call (303)-434-5603.

HARTWELL GA
MAY 17–18

The Lake Hartwell Hamfest, May 17–18, sponsored by Toccoa (Hartwell GA and Anderson SC) ARC, will be held at the Hartwell Group Camp, Hwy 29, 20 miles west of Anderson SC and 3 miles east of Hartwell GA. Campground opens by 6 pm, May 16. Talk-in on 146.295 + 600, 146.19/.79, 147.93/.33. Free flea market space. Tickets and information available from M. A. Counsell W1BNS, 215 Nottingham Way, Anderson SC 29621; (803)-261-7018.

HBØ DXPEDTION
MAY 22–JUN 2

The Wiesbaden Amateur Radio Club, WiesARC, an ARRL affiliated club from West Germany, will be found on the air again from Liechtenstein during the club's eleventh annual DXpedition from May 22 through June 2, 1986. The club will be operating the HBØ/DA1WA callsign on all bands using both CW and SSB. Each contact with DA1WA counts heavily toward the club's Urkunde (award) Certificate. Urkunde information may be obtained from the QSL managers. US and Canadian stations QSL (with 22-cent SASE) via regular US mail (22 cents) to Steve Hutchins KN6G/DA2HS, Box 4205, APO NY 09633-5374. All others QSL with IRC via Hugo Jakobljevich, Im Weinberg 10, D-6200 Wiesbaden-Auringen, West Germany.

CAMBRIDGE MA
JUN 16–20

The Massachusetts Institute of Technology is again offering a program of applied imaging, "Techniques in High-Speed Photography and Videography." The special summer program will be held from June 16 to 20. This photoinstrumentation program of complimentary lectures and laboratory experiences is under the direction of C. E. Miller and Dr. Harold E. Edgerton. It includes two full days in the MIT Stroboscopic Light Lab. For further details, contact: Director of the Summer Session, E19-356, Massachusetts Institute of Technology, Cambridge MA 02139.

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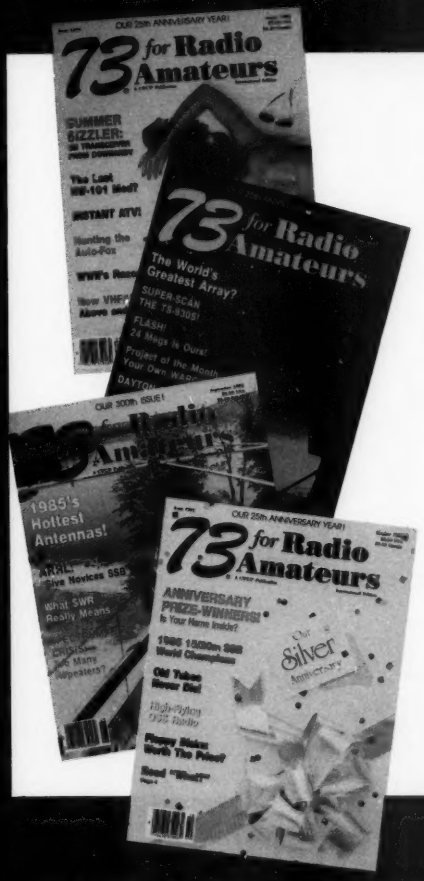

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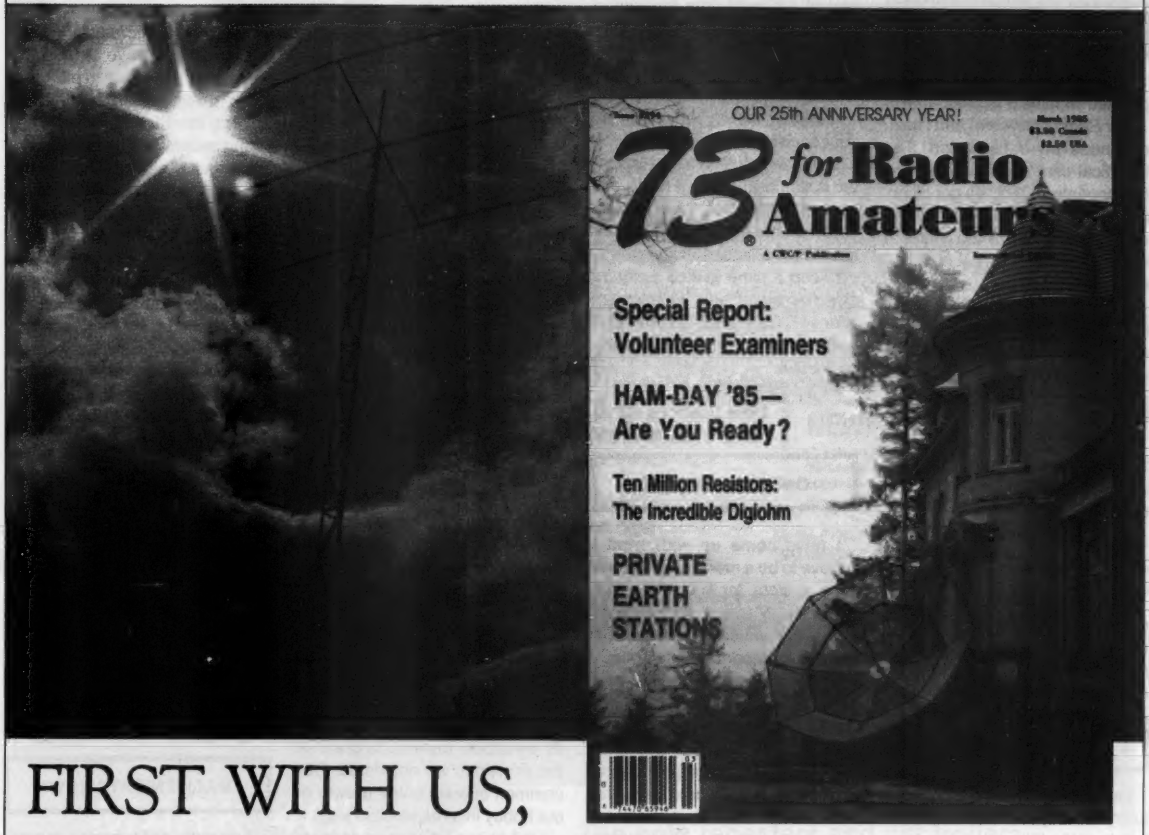

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363R6

LETTERS

AT YOUR SERVICE

In general, I have been very pleased with the improvements in *73 for Radio Amateurs*, and I have continued my subscription. The technical content of your articles has improved. QRX is a good section. I like the format and the covers. The breadth of the material is excellent, from editorials to advertising.

However, you seem to have forgotten that the average age of amateur radio operators is about 46 years. Why have you forced those of us who wear bifocals to get out the magnifying glass?

I am not a printing expert; I don't know how many "points" the type is, but it is too small for lots of us out there.

Keep up the good work with *73*!

Staff Stafford NJ8F
Delaware OH

Don't anybody, not ever, oops—Don't anybody, not ever, say that this magazine is not responsive to its readers—KA1MPM.

MONEY OR LICENSE

I am pleased to have this opportunity to respond to Perry Donham's "What?" editorial in your January issue.

I am among those who agree with Perry's hard-line stand on the issue of ham-band commercialism. The editorial correctly made this point: Most of us do not intentionally use the ham bands for commercial gain.

Last week I heard a K1 refuse to accept a formal piece of traffic on one of the local nets because it had a commercial nature. The W2 holding the message commented, "I thought that it would be OK, since it made it this far." Wrong.

It's your license, your station, your decision.

Donham's self-imposed standard is simple and safe. That is, ask yourself whether "the action could eventually result in money exchanging hands."

I keep a dime tucked away inside my wallet next to my ham license. That reminds me that sometimes I need to decide which one to use.

Regards, and 73,

Dave Bushong KZ1O
Nashua NH

ONE MORE CHOICE

I have come up with what I believe to be a more fair and equitable system for licensing amateurs. It may sound like a rehashing of the no-code license, but there is an important difference.

In my system, there would be a basic amateur license with either no operating privileges or just 50 kHz on the 50- and/or 220 MHz bands with full code and phone privileges. This would give the newcomer a taste of what can be done as an amateur. Then higher licenses would be by endorsements by passing the appropriate examination elements.

For example, passage of exam elements 1A, 1B, and 1C would give only code privileges on the respective Novice, General and Advanced code subbands. Passage of exam elements 3, 4A, and 4B would give phone privileges on the respective Technician, General and Advanced phone bands. The requirements for the basic amateur license would be element 2 and a 100% reproduction of the Morse code, matching the representations with the appropriate character. (Most amateurs who operate only phone cannot copy the code at their license level anyway.)

This way, they would at least know it. And this would allow people who cannot copy code due to some handicap, the chance for a license. Then, to keep the Extra bands sacred, you would have to have endorsements for both 4B and 1C to have privileges there.

I hope that you will publish this so that the amateur community will have one more alternative to choose from.

Steve Sulze WD0GIY
Crestwood MO

HELP HOBBY GROW

I've been reading some negative comments about the proposals before the FCC to enhance Novice privileges. Both the ARRL's RM-5038 and my own RM-5022 through RM-5025 request small band segments, restricted power, and the inclusion of digital modes. We never intended to "give the store away," nor do we expect the FCC to grant all the privileges we requested. Our common interest is the growth of our hobby in a responsible way.

I fail to see what you opposers fear. There will be no loss of "higher class" privileges. Who protested the access we gained to 30 meters, or 12 meters, or 902 MHz? The Novice operators have gained nothing. The Technicians gained a band but it is not really an incentive to Novices to upgrade. The big incentive to Novices seems to be 2-meter FM, and that is why my proposal did not include that band.

The ARRL's proposal includes more kHz than mine and is less practical with its inclusion of the 1246-MHz band. I have seen my proposal mentioned in only one publication (*Worldradio*, September, 1985) and have received no comments. My aim is to offer non-hams a Novice license that will attract intelligent adults and young people. We need computer enthusiasts, story tellers, teachers, students, accountants, laborers, etc. Our record shows that we cannot lure them in any numbers with our CW-only Novice license.

Teach a Novice or an upgrade course like I do and you will see the work that goes into each new ham. You old-timers may forget that ham radio and electronics are a new language to the non-ham. We can help squash the myth that equipment is too expensive if we offer new hams phone and digital modes as well as CW. The equipment will be of more use and will seem a better value. Besides, Novices really do *earn* a license.

If, after reading this, you still think enhanced Novice privileges are a bad idea, go read the actual proposals and then comment to the FCC.

Larry W. Garens WD5H
(ex-KC5OQ)
Brady TX

MACHT NICHTS NOW!

I recently encountered a problem which I feel should be brought to the attention of the amateur group for others contemplating a visit, or residence in Italy.

We moved to Italy from Niagara Falls in December of 1984. In January of 1985, I submitted the necessary paperwork for an Italian license.

Sometime later, I received a

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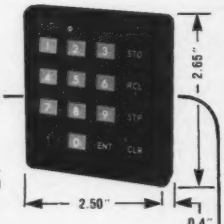

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temporary license and more paperwork, along with a request for two "certified photos" plus twenty US dollars, cash only. Again, much later, I received the photos *back* because they were written on.

"How else can you certify them?" asked the US certifying official?

Straightened *that* out supposedly, and *later* received another temporary license application.

Here it is, December of 1985, and two weeks ago received another very official-looking piece of paper that turns out to be *another* temporary permit along with a letter to the effect, "congratulations, *now* you can begin the application process for obtaining a permanent Italian license!"

Macht nichts now! We moved back to Germany where, thank goodness, the amateur licensing system is *much* more efficient—it took me about 30 minutes to get my license versus the eleven-months-and-still-in-process in Italy. I think that after they received the US *cash*, that was the prime concern. You were then relegated to the Italian paper mill.

I would strongly advise any potential radio-amateur visitors to Italy to thoroughly investigate the procedures before attempting reciprocal licensing! To me it was very disappointing.

Jerry S. Richter KI1WY/DA2RI
Munich, West Germany

WEIRDNESS REVISITED

Great editorial in the January issue! May I add some thoughts of my own?

I guess this could be construed as picking on the simplex autopatch boys (again), but I wonder—just wonder, mind you—about the propriety of the brethren setting up a simpatch system and then charging individual members of the group for the privilege of using it.

You see, if I pay dues to a repeater to keep it up, I am buying the right to keep the system going, and that includes the right to use the repeater, plus its autopatch, its electronic bulletin board, or its remote bases—or all of the above.

The problem with a paid simpatch group is that all you are paying for is the simpatch function, which smacks a lot of competition with the local cellular system—especially if it is abused, which I still think it is in all too many instances. Maybe I'm wrong. Maybe a simpatch can offer other things as well, but I haven't seen that sort of thing actually put into practice.

Now, mind you, I have no serious problem with *repeater* autopatches. I've turned in a couple of DWIs using ours, in the last year, and that is enough to convince me that autopatches are in the public interest, when all is said and done. I just believe that the rise of simpatches may be the beginning of the end for amateur interconnects to the telephone system in any form. And that's not just me talking.

Re the QRX item "Weirdness," we have some retractions to make. Suffice it to say that the intent of the CTIA with regard to S-1667/R-3378 has been terribly misrepresented in the amateur media, much to our embarrassment, I'm afraid. I feel that, as a group, we really blew it with this one, and our credibility has suffered as a result. See the December *220 NOTES* for details.

That is not to mean that S-1667, *et al*, should be ignored. This is a prime example of a horribly written bill that should be either cleaned up or killed, the question of Right-to-Listen vs. Rights-of-Privacy totally aside. With this question included, I would strongly suggest that a technological solution to the privacy issue is far superior to a political one, and again, I refer you to the December *NOTES*, which should be out in a few days.

Art Reis K9XI
New Lenox IL

DONHAM'S LAW

KW1O's attack on commercialism in the January, 1983 issue of *73* is well stated. There are, in fact, many situations encroaching on the FCC rules on noncommercial use of Amateur Radio.

The problem with Donham's Law is in the "could eventually." How do you allow for the discussion of equipment among hams? Someone will be influenced to go buy something as a result. I say this is too broad in scope.

Then do you say we can't talk about FCC exams under the VEC program since there is a fee charged for registration, and that is certainly "money exchanging hands"?

I think, in general, hams exercise excellent judgment in how they use the air.

Staff Stafford NJ8F
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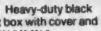

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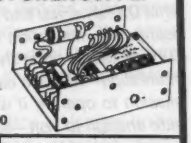

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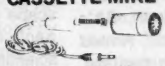

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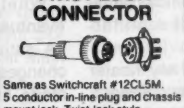

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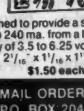

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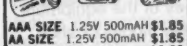

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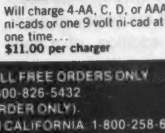

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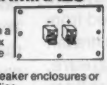

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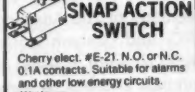

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73 INTERNATIONAL

Just because I started this column as a result of visiting DX hams is no reason you shouldn't put in your 2¢ worth and let me know what DX news you find most interesting. My inclination is to have DX ops tell us what they think is interesting—how we can get permission to operate if we're fortunate enough to visit—any coming DXpeditions—what's doing with repeaters—things like that. What do YOU find most interesting? Since we have a world hobby, I think you'll be as interested as I in what is going on. If nothing else, it gives us something to talk about on the air which, from what I'm hearing these days, can't hurt.

—Wayne.

AUSTRALIA

Jim Joyce VK3YJ
44 Wren
Altona Australia

VK5 AMATEURS GO RAIL MOBILE

The idea to work Rail Mobile on the Trans-Australian Railway from Adelaide to Perth developed from a suggestion that two Australian National-employed amateurs, Keith VK5VAX and Graham VK5BGP, undertake the activity in their off-duty period, with the approval of Australian National. The proposal that eventually gained acceptance involved the allocation of two Australian National tickets, the provision of a Wegman 1st class coach for the trip, with media publicity to be sought by Australian National promotions officers, Mr. Bob Sampson and Mr. John Beatty.

The SA Division, through its Jubilee 150 Coordinator, Graham VK5AOZ, was asked to provide equipment and antenna configurations within the parameters of height, location, and installation set by Australian National for the Wegman Coach. The group of three amateurs, Alan Roocroft VK5ZN, Peter Koen VK5BPA, Secretary of 2nd Adelaide Scout ARC, and Graham Horlin-Smith VK5AOZ, were assisted by Keith Pattman VK5NAX, a senior conductor on the outward journey from the Adelaide Terminal departure on Wednesday, September 11, at 12:40 pm.

The turn-around trip left Perth Saturday, September 14, to reach Adelaide on Monday the 16th at 5 pm. Graham VK5BGP joined the group for the return home from Kalgoorlie and also to assist in breaks from his conductor's duties on the train. Five amateurs piloted the rigs during the trip.

Several antennas were installed on Saturday the 7th, including a 25m longwire, a 40m Hustler Whip and a tapped 40m Whip. Two-meter equipment, a Kenwood TR-2500 hand-held with a base supply unit, and a KYOKUTO 144-10FX R2 (FM) with a home-brew scanner, and a 60-Watt amplifier worked from a quarter-wave magna base vertical. A Kenwood TS-93X and a TS-820 provided the fire power for the open wire and the verticals above the carriage roof.

The optimum height of all antennas was fixed at 0.5 meters to allow for clearances of bridges and tunnels, although it was possible to lift the configurations to 1.4 meters between Port Pirie and Kalgoorlie. The problem areas really amounted only to a total distance of 10 km close in to the Keswick and Perth terminals, out of a total journey of 5.320 km. The difficulty in real terms, to make antenna changes, was time and suitable stopovers to periscope the antennas and thereby improve the capabilities of the equipment from the railway mobile location.

The *purpose* of the activity, mutually agreed by the WIA (SA Division) and Australian National, was to give promotion to the two organizations—the Trans-Australian Railway link between Adelaide and Perth, and the hobby of amateur radio. In addition, of a secondary nature, was the promotion of SA and its Jubilee 150 celebrations, including the Grand Prix held in Adelaide in November, 1985. These objectives were as follows:

- To acknowledge Westrails link with Australian National on the WA side of the border,
- To record a first for amateur radio to work Rail Mobile across the Nullarbor, and
- To demonstrate amateur communications as a valuable alternative means of world communications and to provide meaningful goodwill exchanges with people around the world.

The promotional purpose of the five-day round trip was acknowledged by the world of amateur radio by the use of the callsign V15JSA/Rail Mobile (Trans-Australian). V1=special event, WIA (75th Anniversary), oldest AR group in the world, 5=South Australia, JSA=special suffix allocation for *Jubilee South Australia* and Rail Mobile, courtesy of Australian National.

The uniqueness of the special callsign and the location of the amateur-radio stations on the Trans-Australian, it was hoped, would attract special attention to the activity, and it surely did just that!

Amateur displays and public relations were shared jointly by the amateurs making the trip, with overall coordination responsibilities given to Peter Koen, SA's Divisional "Mr. Magic." Armed to the gunwales with posters, awards, QSL cards, banners, flags, and my copies of a home-brew screen print: smcsa amateurs *live* across the nullarborsmc.

The print surpassed any theater coming-attraction poster. Peter's personal professional promotion provided the excellent communications links needed between amateur hobbyists, passengers, visitors, VIPs, Australian National Staff, and flora and fauna of the Nullarbor alike. When out of range of all known two-meter repeaters along the way, Peter did most of the talking to the passengers and captured, on video and camera, a documentary of the lively amateurs' "Pilgrim's Progress."

The identification and project mission of the amateur-radio-coach ADO83 was boldly stated on the platform side of the 25-meter super-sleeper carriage: SA Amateur—World Communications—with Australian National—Across the Nullarbor.

Even the kangaroos, emus, and dingoes, if they could read, and the occasional passerby en route, would have been impressed, if not by the message and callsigns, then by the novel antennas (25-meter longwire and traditional verticals) which graced the roof of the carriage.

The longwire was supported half a meter above the roof by 10 spaced, half-inch, pieces of varnished dowling from a 1-inch piece of water pipe sleeved with dowling at each end of the coach, which were bolted into steel brackets used for flags or external lighting back in the coach's preretirement days. The verticals were bracketed to hand rails on each side of the entrance and exit passenger doors.

The amateurs transformed three adjoining sleeping berths into QTH-like shacks with QSL cards from all over the world, displays of well-earned awards, and even stern reminders of schedules, repeater listings, operating cue cards, amateur photograph displays, and even more stern reminders of footy (Aussi Rules) affiliations.

Card tables supported rigs, working equipment, and logs—nothing new to the familiar sight of a home QTH inside a house, or at a safe distance from the XYL's domain. Comfortable portable beds made working in the horizontal plane with a good view of the landscape outside an excellent prospect. Indeed, it was a worthy scientific experiment to pilot amateur-radio rigs from unusual positions.

What were the results and eventual outcomes?

- A satisfactory number of exchanges—in excess of 500—was made along the way. The bulk were with Australian stations but contacts with the USA, Japan, USSR, NZ, Canary Islands, Indonesia,and South Africa were made.
- Excellent media coverage afforded by television and commercial radio stations.
- Australian National should be well-pleased with the interest sustained by the presence of amateur-radio stations on the Trans-Australian, the goodwill and the exchanges with passengers, also with the overall media presentations in Adelaide and Sydney.
- The use of both VI5JSA and VK75A/Rail Mobile callsigns stimulated the anticipated expected responses.
- Secondary priorities and objectives were successfully achieved by way of the special callsigns with due attention given to SA and its forthcoming activities in 1986.
- The support, back-up, and interest was willingly shared by all Australian national and Westrail per-

sonnel, which made the trip all the more memorable and worthwhile. The travelers were thrilled with the personal attention and the super togetherness engendered.

•Amateur radio gains were significant in terms of promotion and sharing the hobby with the general public, in particular the opportune meeting, and links established with the CARC (Goldfields Amateur Radio Club) and the WIA (WA Division), thus reaffirming the excellent rapport that already exists between amateurs.

•The GARC group of Kalgoorlie presented a framed Gold Award to the travelers, which in turn was presented to SA Divisional President Dick Boxall VK5ARZ—a very beautiful momento of the historic trip. A welcoming "computerized" banner to the SA amateurs at Kalgoorlie was greatly appreciated.

•The well-documented video and camera story of the trip across the Nullarbor, the tapes of the VK6 broadcast, and taped interviews in transit provide a live history for future use.

The overall results of the lighting preparation and culmination (less than three weeks from acceptance to close), were most rewarding. It was a job well done by a very professional group of amateurs led by Bob Allan VK5BJA. The experimentation in rail-mobile antennas and promotional activities carried out by the group was new, save the excellent pioneer work achieved by Bill Main VK6ZX back in the late '70s.

GREAT BRITAIN

Jeff Maynard G4EJA
32 Waldorf Heights
Hawley Hill
Camberley, GU17 9JQ
England

Like many societies concerned with leisure-time activities, the RSGB (Radio Society of Great Britain) is largely under the control of amateurs. There are, of course, full-time paid administrators to run the office and undertake the requirements that the law imposes (the RSGB, at least, is registered as a company).

But the policy-making group, the Society Council, is selected from the membership at large. The Society president is selected by the Council. Over a period of years, one sees the same names appearing as potential or actual council members, committee members, and/or contributors to *Rad Com* (the society's journal, *Radio Communication*), and so on.

Is this a good thing or a bad thing? I think it is certainly true that an element of change, particularly when it involves new blood, is a good thing. People do get set in their ways (and become guilty, perhaps, of being unable to see the woods for the trees), and an influx of new and fresh ideas can only help to bring progress to any organization.

However, that is not to say that wholesale change is good. There needs to be continuity and experience and maturity (and even the steadying hand of elder statesmen). In other words, a balance is wanted between the new and the experienced.

So it has generally been in the RSGB for a great many years. But not for much longer if three members get their way. Messrs. Lundegard G3GJW, Smith G4AJJ, and Crosland G6JNS have ruffled a few feathers with their circulation of documents calling for broad changes in the Society.

I do not wish to bore you with the details (of which there are many) but, instead, will summarize their main point. This seems to be that the length of service of any one individual in a range of posts shall be limited (they suggest six years cumulative service). This, of course, would have the effect of removing all the old hands.

The RSGB has risen to the challenge and produced a lengthy rebuttal of the proposals. I think this is a mistake because the action looks defensive and suggests that there is something for "the few" to protect.

You will note that I have avoided picking sides. I really do not want to be drawn into the argument which inevitably will follow now in the public eye (in the columns of *Rad Com*, if nowhere else). However, I will say that I appreciate the efforts of my fellow amateurs who devote a lot of their time and energy to making my hobby more enjoyable (and that of a lot of other people—at the end of October there were 27,900 Class-A licenses and 27,780 Class-B licenses in force in the UK).

With the imminent availability of the 50-MHz band to all UK amateurs, the RSGB has produced a band plan. This is as follows, and any comments on it should be sent to G3ZNY.

50.000–50.100—CW only
50.02–50.08—Beacons
50.100–50.400—Narrowband modes
50.110—DX Calling
50.200—SSB activity
50.300—CW MS
50.350—SSB MS
50.400–50.500—All Modes

For those of you equipped with a V23 modem (Viewdata type, 75/1200 bps), the RSGB is operating an experimental "Databox." The telephone number from the US is 44 707 52242.

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

As promised in my last column, I am able to bring readers a report on the IARU Region III Conference held in Auckland, New Zealand, Nov. 12-17, 1985, through the courtesy of *Break-In* magazine reporters, Craig Crawford ZL3TLB and Scott Campbell ZL3NR. They made their notes available to me as I was unable to be present at the conference.

It would be difficult to find a more picturesque venue than the Rose Park Hotel in Parnell, Auckland. This modern and spacious hotel is directly opposite the famous Parnell Rose Gardens, where the roses were just coming up to full bloom. From Saturday the 9th there was a scene of frenzied activity as the administration team, ably led by Arthur ZL1HV, worked to prepare everything in time for the opening.

The behind-the-scene administrative workers, led by Neville ZL2AKV, NZART General Secretary, typed, photocopied, and collated the material for the papers to be presented to the Conference (which had escalated from 69 to 85), and inserted them into the well-filled folder for the 70 delegates and observers. Neville was assisted by Shirley ZL1BI, Gail ZL2SZ, and Jamie ZL2NN.

The first batch of overseas delegates arrived at 8 pm on Sunday evening on a flight from Melbourne where they had attended WIA's 75th Anniversary Dinner the previous night. The 29 arrivals were whisked up to the Manukau Room of the International Terminal for a formal welcome.

A surprise for many of them was being presented with an amateur-radio license from within the special callsign group of ZM0ZAA to ZM0ZZZ, plus 100 customized pictorial QSL cards. Some of the visitors made their first QSOs traveling from the airport to the hotel. The ladies accompanying the delegates were not forgotten—they found well-filled satchels in their hotel rooms with information about the Auckland area, conference badges, and general information about the entertainment especially for them during the time their men were in conference.

Some weary, jet-lagged bodies surfaced early morning. Fortunately for most delegates, this was to be a quiet day. For some however, the main business was the continuation of the IARU Administrative Council meeting which had started in Melbourne the previous Friday. This meeting was chaired by Dick W1RU, and attended by K1ZZ, JH1VQR, 9V1RH, VK3KI, W0BWL, and YV5BPG. Ignoring meal breaks, they labored from 9 am until 7:30 pm.

1985
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AUCKLAND • NEW ZEALAND

The ladies, with some of the local people, spent the morning at Kelly Tarlton's excellent Underwater World, a huge aquarium built within Auckland's old sewage tanks. Sharks, sting-rays, octopi, and many species of local fish swam around and over the transparent walk-through tunnel system. In the afternoon they visited the Begonia House of the nearby Winter Gardens.

On Tuesday morning the Region III directors met at Rose Park Hotel. Masayoshi Fujioka JM1UXU, Keigo Komuro JA1KAB, Tsuyako Miyagi, Michael Owen VK3KI, David Rankin 9V1RH, and Arthur Godfrey ZL1HV, debated for much of the day.

Late Tuesday, after airline- and customs-clearance delays, the delegations from Korea, Japan,

Delegates and officials to the 6th IARU Region III Association Conference, Auckland, New Zealand, November, 1985. Photo courtesy of Break In, *NZART official magazine.*

Indonesia, and China arrived. Also on this flight was David Evans G3OUF, general manager of RSGB. The final group of six, including Dick Butler, the secretary general of ITI arrived at 10 pm.

At last, after many hours of preparation, all delegates and observers were present, and the 16,000 pages of documentation were ready for the big event.

The conference got under way at 9:30 am with the official opening. Region III secretary, Masayoshi Fujioka JM1UXU, chaired the opening ceremony and officially welcomed the delegates. Terry Carrell ZL3QL addressed the gathering as president of the host country, and introduced Dame Dath Tizard, the Mayor of Auckland, who, after welcoming them to the city of Auckland, lightheartedly advised that she had arranged excellent weather for the duration of the Conference.

Other speakers were the Honorable Jonathon Hunt, Postmaster-General, and Dick Butler. The Assistant Director General of the New Zealand Post Office, Derek Rose, gave an impromptu speech amplifying the Minister's remarks, and finally Dick Baldwin W1RU spoke thanking the previous speakers for their kind remarks.

After morning tea (coffee break), the first of the 17 90-minute sessions commenced. Present at the sessions were 60 delegates and observers from 11 countries. A very special welcome was made to the delegation from the People's Republic of China, Mr. Wang Xun and Mr. Huang Yongliang, officially attending an amateur-radio conference for the first time.

As is tradition at such conferences, the president of the host society was nominated as conference chairman. This was passed with acclamation, and Terry Carrell ZL3QL took the chair. The Region III Secretary, Masayoshi Fujioka JM1UXU, was nominated as conference secretary, also by acclamation. The Credentials Committee, one of the various committees essential for the smooth running of the conference, reported that all attending Societies were correctly represented, and that proxies for Bangladesh, Hong Kong, Pakistan, Singapore, and the Philippines were in order.

The first of the 93 papers to be received and discussed was the report from Region III secretary, who was happy to announce that the Amateur Radio Club of Tonga, (ARCOT) had just been admitted as the 24th member society of Region III.

Formal reports from the four Region III directors were tabled and accepted with little discussion as lunch was ready.

The various member societies then reported on their activities, and here are some items of interest from the reports. JARL indicated concern at the decline in the rate of increase of membership, down to 10,000 per year. PNGARS (Papua New Guinea) believed they now had the highest amateur repeater in the region, atop Mt. Albert Edward at 3,990 meters above sea level.

ARRL reported on behalf of 37 of the members in Region III territories, noting after a decline in the number of amateurs joining ARRL, they were now experiencing a 5-percent growth. ORARI (Indonesia) announced a new Radio Regs just introduced which included creation of a no-code license. They also hoped to work toward a reciprocal licensing agreement with New Zealand.

WIA (Australia) were happy to report that most of the WIA submissions had been acted upon in the new Regulations and Radio Communications Act which were introduced recently. WIA, representing SARTS (Singapore), mentioned that many apartment dwellers there must pay extra rent for their antennas.

MARTS (Malaysia) entertainingly explained the difficulty they have with authorities. It was reported that the administration's policy seems to have changed from "find out what they are doing and stop them" to "find out where they are going so we can lead them." Until recently, even communications receivers for SWLs were illegal in Malaysia.

RSGB announced only a few days previously that approval had been given for amateurs in Britain to conduct Morse testing as from April, 1986.

KARL (Korea) announced permission had been given for a station to operate from the 1988 Olympic Games to handle third-party traffic for games' participants.

Commenting on the FARA (Fiji) report, ITU Secretary General Dick Butler spoke of his involvement in setting up the Telecommunications Training Center in Fiji and the encouragement it gives students to obtain their amateur license.

Reports from Region I and II were received and Mr. Butler offered ITU's assistance in setting up volunteer training programs in Region I and II countries also. A report from IARU Administrative Council meeting included their adoption of a policy for extensive preparation for future WARCs, including participation in CCIR activities and also a revision of the 28-MHz beacon system.

Ian Ashley ZL1AOX was invited to speak on packet radio and he expressed the opinion that packet radio be band-planned for the phone portion of each band, as is ATV. Dick Baldwin W1RU advised that Region I is uneasy about the proliferation of packet radio on the bands, especially 20 meters.

The conference then considered six papers dealing with band-planning. After some discussion on each paper, Working Group 1 was set up to review the band plans adopted, especially the 28-MHz band, and the position of packet radio and other special modes in any plan.

An NZART paper urged other Societies to negotiate with their administrations for the release of the band 10.15–10.20 MHz on a local non-interference basis. Some delegates were apprehensive about this action, preferring to gain and live with WARC 79 bands first. The NZART proposal was adopted.

Day 2 of the conference opened with discussion on the usage of the new bands made available through WARC 79 (10, 18, and 24 MHz). It was reported that in Region III 10 member societies had access to the 10-MHz band, and seven Societies to both 18 and 24 MHz. The other Societies had access to the 10-MHz band, and seven Societies to both 18 and 24 MHz. The other Societies were encouraged to take appropriate action to acquire usage of these bands and help to populate them.

After a discussion on the involvement of IARU in the forthcoming ITU Conference, preparations for the next WRC (expected in 1991), and the financing of these activities, QSL cards came into the discussion arena.

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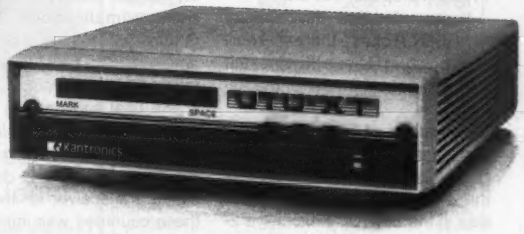

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The Conference accepted a proposal from JARL to adopt the Manila-Conference standard QSL card size and layout, and JARL offered to coordinate an investigation into automatic sorting of cards. Papua New Guinea and Fiji papers on the use of the "honor system" when claiming awards drew much discussion. They argued that QSL cards were a hassle and an expense to rare DX and awards should be claimed by log entry only, as is done in New Zealand. ORARI countered this with the suggestion that QSL cards have many uses, including the promotion of the country and also of Society membership. The PNG/Fiji proposal was lost.

It was noted that with the entry of ARCOT (Tonga), there was only one society in Region III at present that was not a member of the Association.

The report of RAST (Thailand) caused several delegates to express disquiet at the mention of the use of several spot frequencies in the otherwise exclusive 2-meter amateur band for Volunteer Radio, a group of volunteers assisting the police by reporting suspicious happenings. It was felt that this might put ideas into the heads of other administrations along similar lines.

An international model standard, setting down minimum standards for gaining a general amateur license was proposed by NZART and JARL. In many countries that are newcomers to amateur radio, the administrations were often at a loss to set standards and appealed to the amateurs themselves. Therefore the model standard would be a help to these administrations. RSGB expressed the feeling that the proposal should not result in relaxing thestandards. The proposal was adopted.

From this, the concept of a worldwide common amateur license was raised. The effort of the European Societies toward this was noted and encouraged. ORARI commented that while they supported the idea, they could not see it happening in Indonesia in the forseeable future. The formulation of a special study group to investigate legislation that had bearing on amateur radio was suggested and set up, and the proposal passed.

Papua New Guinea's second paper highlighted the abuse of obtaining special prefixes, especially for non-radio events. A proposal to limit the use of special prefixes to national, international, and/or amateur-radio events of outstanding nature was accepted.

Four papers related to the subject of amateur satellites. JARL described progress on JAZ-1, whose launch has now been delayed until August, 1986. The first satellite's construction and testing has been completed and the second is undergoing testing now. The project is expected to cost $US1.6 million. Another JARL paper suggested that IARU coordinate all future satellite programs with ITU and satellite organizations.

The WIA expressed concern over the lack of information on progress of the various projects, on planned launches, and on frequency implications. Working Group 4 was formed to decide any action the Conference needed to take on these matters.

The final subject was the promotion of amateur radio in the developing countries. An NZART suggestion that IARU develop a simple transceiver for the use of these countries was immediately responded to by the Japanese. They showed the Conference a kitset transceiver that produced five Watts output on 15 meters, costing about $US60. NZART commented that, especially in the Pacific Islands, the most desperate need was for training and materials for training, at the very basic level, e.g., tools, books, and expertise. CRSA expressed appreciation for the supportive comments and the reception of their paper by the Conference. Working Group 5 was set up to identify appropriate means to encourage and promote amateur radio in developing countries, and recommend what action should be taken by the Region III Association and its members.

Day three saw the various Working Groups meeting all morning. There was a problem caused by the fact that many members had been nominated for more than one working group, and only three of the six groups had finished by the time Conference recommenced at 1300 hours.

NZART presented the first of four papers dealing with Intruder Watches. They commented on the worldwide nature of the intruder problem and said that a major improvement would be to get all broadcast stations removed from the 40-meter band. Also the Conference was informed that one of the main things to come out of the Geneva Study Group was the confirmation by the International Frequency Registration Board (IFRB) that the IARU Monitoring Service can legitimately call on the IFRB to monitor intruders on our bands.

CSRA noted that Radio Beijing was a major offender in the 40-meter band, and they suffered from this as well. They commented that there were historical reasons among others for this problem and expressed a desire to work towards fixing it. ORARI also reported discussions with their authorities to clear Javanese broadcast stations from 40 meters, and also Indonesian CB interference.

Other items discussed before the Conference adjourned at 1500 to allow the Working Groups to continue their deliberations were that Region III adopt the IARU International Locator System (Maidenhead System) as soon as possible. The Amateur Radio Direction Finding Rules from Region I were considered, and the subject of direction-finding activities in China and Japan described by delegates from those countries.

The IARU Region II Award together with some minor changes to cater for the changes in Region III membership were explained by NZART, and Conference showed its appreciation to NZART for operating the Award for the Association. Emergency communications as outlined in the WARC 79 resolution number 640 were discussed, and the Conference adopted Region I Emergency Procedure "in principle" after some discussion.

At the start of day four, the meeting considered an International Study Group report on the aims and operation of the monitoring service and adopted its recommendations unanimously. A new Region III monitoring service coordinator is required now that Bob Knowles ZL1BAD has been appointed as world coordinator.

Working Group 1 considered band planning, and presented their final report to the Conference. It described band plans for all amateur bands from 7 to 1240 MHz, but due to insufficient information did not consider plans for the 160- and 80-meter bands. Another working group will decide on these before the 1988 Conference. The plan for the 10-meter band included shifting all 28-MHz beacons to the band 28.190–28.200 by 1990. The Group made no special provision for packet radio but recommended that it be allowed in both the phone and RTTY parts of the bands.

Working Group 4 considered the Satellite Service and recommended that all Societies should provide support and funding for all satellite projects; that all frequency-planning matters for satellites be coordinated by IARU, and that the Amateur Satellite Service be represented solely by IARU at ITU Conferences.

Working Group 5—assistance to developing countries—decided the best way to arrange this program would be to ask all Societies what assistance they needed and what type of assistance they could provide.

Six papers relating to the International Beacon Project were considered, and then the Conference decided to adopt the NZART paper which called on the Administrative Council to provide all societies with information on the reporting procedure, to disseminate up-to-date beacon-status information, to review the 28-MHz project, and to provide a beacon kit to developing countries, and coordinate the publicity of the projects.

Contests were next on the agenda, and the Conference considered the adoption of preferred segments of the bands for contest operation as recommended by Region I. It was resolved that a working group consisting of representatives of JARL, WIA, NZART, and ORARI be set up to correspond and recommend on any preferred segments considered desirable.

The Conference proclaimed June 17 to be World QRP Activity Day, to encourage low-power activity—their decision was based on a Region I idea. The Conference also adopted an Administrative Council resolution to establish a World Radio Amateur Day intended to publicize amateur radio universally.

Some aspects of EME operation, packet radio, AMTOR, and RTTY standards, and the growing number of "unattended amateur stations" were then discussed.

A paper on problems resulting from some DXpeditions due to the behavior on air of some of the stations participating was presented, and after much discussion, accepted. ORARI commented that the DXpedition operator was in the best position to deal with this problem, and that IARU was not in any real position to be able to police this sort of thing.

Moving on to the preservations of standards of amateur-radio operation, recommendations by NZART noted the misuse of amateur radio by pirates and others, and emphasized the need to follow the spirit of the ITY Radio Regulations. The President of IARU

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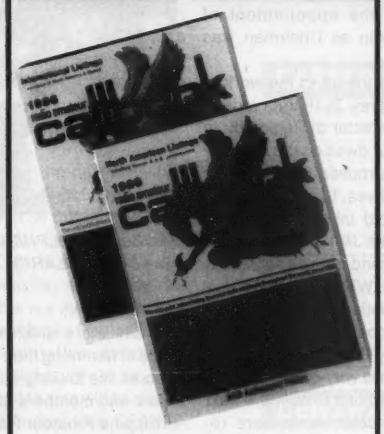

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MRF426,/A*	25W	18.00	42.00
MRF428**	150W	55.00	125.00
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MRF450,/A	50W	14.00	31.00
MRF453,/A	60W	15.00	35.00
MRF454,/A	80W	16.00	38.00
MRF455,/A	60W	12.00	28.00
MRF458	80W	20.00	46.00
MRF460	60W	18.00	42.00
MRF464*	80W	25.00	60.00
MRF466*	40W	18.75	48.00
MRF475	12W	3.00	9.00
MRF476	3W	2.75	8.00
MRF477	40W	11.00	25.00
MRF479	15W	10.00	23.00
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MRF237	4W	136-174	3.00	—
MRF238	30W	136-174	12.00	—
MRF239	30W	136-174	15.00	—
MRF240	40W	136-174	18.00	—
MRF245	80W	136-174	28.00	65.00
MRF247	75W	136-174	27.00	63.00
MRF250	50W	27-174	20.00	46.00
MRF260	5W	136-174	7.00	—
MRF261	10W	136-174	9.00	—
MRF262	15W	136-174	9.00	—
MRF264	30W	136-174	13.00	—
MRF607	1.75W	136-174	3.00	—
MRF641	15W	407-512	22.00	—
MRF644	25W	407-512	24.00	54.00
MRF646	40W	407-512	26.50	59.00
MRF648	60W	407-512	33.00	69.00
2N3866*	1W	30-200	1.25	—
2N4427	1W	136-174	1.25	—
2N5591	25W	136-174	13.50	34.00
2N5642*	20W	30-200	13.75	34.50
2N5945	4W	407-512	10.00	—
2N5946	10W	407-512	12.00	—
2N6080	4W	136-174	6.25	—
2N6081	15W	136-174	7.50	—
2N6082	25W	136-174	8.90	—
2N6083	30W	136-174	9.30	24.00
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commented that, strictly speaking, policing this sort of thing was the responsibility of individual member societies. ORARI replied that they accepted this, but that recommendations by an international body were a very useful lever to help them initiate action in their own country. After considerable rewording to fine tune the meaning, the recommendations were adopted.

Day five commenced far too early for some of the delegates—Saturday night was the social highlight of the Conference, when all delegates relaxed and enjoyed an evening's entertainment, wining and dining, hosted by NZART, when the guests were introduced to some aspects of the Maori culture. The first item was the report of Working Group 2 looking at IARU participation in ITU Conferences. They considered appropriate representation at some designated Conferences, and accepted Councils' goals for the next general WARC. They also recommended continuing participation at CCIR activities, especially Study Group 8.

Working Group 3 presented a 30-page report dealing with changes to the Constitution and By-Laws. In considering this important subject, the meeting studied a large number of changes recommended by the study group. NZART moved the adoption of the proposed changes as recommendations to IARU, and this was passed.

Finances were next for discussion, and as is usual with money matters, there was considerable discussion back and forth, but the recommendations of the Financial Subcommittee were eventually passed almost as presented. NZART proposed the appointment of a regional coordinator for the study of Sporadic-E propagation on six meters, as had been done in Region I, and to recommend that Region II do likewise, to form a worldwide study on the subject. This proposal was adopted unanimously.

NZART presented a paper describing the history of the non-Morse license since its inception in 1963, and the benefits derived from it. It recommended the concept to other Societies as a way to encourage amateur radio. The paper was accepted.

WIA proposed that US be recommended as the preferred mode for sideband operation on all bands. After a lot of fiddling with the wording of the proposal, WIA withdrew it.

There were five nominations for the positions of director for the next three years: Keigo Komuro JA1KAB, Michael Owen VK3KI, D. D. Devan 9M2DD, David Rankin 9V1RH, and Fred Johnson ZL2AMJ. No voting was necessary, and the appointment of David Rankin as Chairman was confirmed.

WIA paid tribute to the work of Arthur Godfrey ZL1HV as a delegate and Director of Region III. In reply, Arthur dwelt on the need for adequate turnover in Association representatives, to get new blood in and avoid inbreeding. Masayoshi Fujioka JM1UXU was elected for a second term as secretary, unopposed. WIA drew the Conference's attention to the extensive backup support for the Secretary provided by JARL, for which the Association is very grateful.

Five invitations to host the next Region III Conference were received from KARL, WIA, PARA, ORARI, and BARL. After a secret vote, it was declared that the invitation from KARL was accepted and that the next Conference would be held in Seoul, Korea, around late October, 1988.

While the delegates were busily engaged at the Conference sessions each day, the ladies who accompanied them were well cared for by the ladies of the host society. Among the activities the ladies visited were tours of an orchard, a potter, a wool shed display, botanical gardens, various scenic drives, shopping trips in Auckland, where the OM's hard earned cash was no doubt well spent on souvenirs, and in the evenings there were receptions hosted by IARU, ARRL, JARL, and NZART.

And so ended the 6th Region III Association Conference, after a very busy five days. The delegates bid each other fond farewell and left for their respective destinations, to come together formally in three years time for the 7th Region III Conference.

PHILIPPINES

Leo M. Almazon WA6LOS/DU2
10098 Knight Drive
San Diego CA 92126

Hello, everyone! Now that I have more free time, you probably will see more articles about the state of hamming here in DU-land. I would like to congratulate the officers and members of PARA, the Philippine Amateur Radio Association, for its 52nd anniversary.

Mel Bednar K6LPN/DU2, current trustee of the Central Luzon Amateur Radio Club (CLARC).

Engr. H. San Juan of the National Telecommunications Commission said that his office is set to carry out Memorandum Circular No. 14-11-82—guidelines and procedures of the Revised Amateur Radio Regulations.

Engr. San Juan has said that proper use of callsigns (DU for Class As, DV for Class Bs, and DW for the Class Cs), their proper frequency allocations and, of course, the "jammers," or illegals using the amateur frequencies for their personal use, will be monitored! Under the new Radio Regulations, violation of any of the provisions of the new laws will be punished by a fine of not more than 2,000 pesos (about $100), or by imprisonment of not more than two years for each offense, or both, at the discretion of the court.

If you have followed my other articles in this column you probably have heard me mention CLARC, the Central Luzon Amateur Radio Club which is a unique ham club in DU-land, in that its members consist of local hams and American hams mostly working at Clark Air Force Base in nearby Angeles City, located about 56 miles north of Manila. The base is one of the largest US airbases outside the United States. One of the club's founding members, Pete Bargas DU1AK, is the only American ham who is legally authorized to use a DU callsign. Pete is one of the OT hams in the country; his hamming in DU-land dates back to the 1930s, when he used to be KA1AK. The Philippines was one of our former territories and was assigned with a KA prefix.

The current president of CLARC is Dr. Ronald Yuson DW2DX. I have known Ronald since his medical internship days. I used to go with him in his rounds in the hospital ward at Central Luzon General Hospital, and also during his duties in the emergency ward. This is where I saw, first-hand, emergency medicine and radio communications hand-in-hand.

Most ambulances are not equipped with radios, as in the States. It is only through amateur radio that quick arrivals of help and diagnosis are made. But unfortunately this happens only when there is a big typhoon or during the Easter holiday when there is a lot of traffic and the government, together with other civic-action groups, invites local hams to help provide much needed communications for emergencies.

DW2DX has been instrumental in a lot of civic-action duties, doubling both as a communicator and a physician when needed. Even though the issue of his callsign came two years after passing his test, DW2DX never got discouraged and found time to be active in ham radio despite raising two harmonics and his medical duties. The local hams and would-be hams should take note and not get discouraged. License examinations and processing do take time, but rest assured PARA and some other well-connected individuals are trying to rectify this pressing problem.

Feb. 16, 1985, was a day to be remembered by the local hams. It was the day of the Hamvention 85. It was held at Camp Concepcion Gonzalez in Novaliches, Metro Manila. It was hosted by several clubs from District 1, and also by the Citizens Band group together

with the Philippine Girl Scouts. The guest speaker was none other than National Telecommunications Commissioner General Ceferino Carreon. There were swap meets, flea markets, a CW contest, and DX contests.

But the significant difference in this year's event was the presence of many OTs mingling with other local contemporary radio enthusiasts. I guess the event's theme, "Unity for Radio," was appropriately embossed in everyone's mind during the whole festivity. More on the Hamvention next time, since there were a lot of activities to be mentioned and lots of film still to be developed!

Speaking of amateur-radio themes, one that comes to mind is this one. "International Friendship and cooperation of all peoples in Asia through Amateur Radio." This, folks, is the theme of the SEANET, the South East Asia Net you can hear operating on 14.320 MHz. The last SEANET convention was held November 16 through 18 at the Eastern and Orient Hotel in Penang, Malaysia.

This net started out as a friendly gathering of Southeast Asian hams on 20 meters every evening but grew to include all other DX stations who regularly check in. Net controllers are VK2MA from Sidney, Tom VS6CT from Hong Kong, and Dr. Ed DU7EG from DU-land. The convention is an annual event and is hosted by the different original Southeast Asian member countries. Last year's SEANET ham attendees were from the Philippines, Japan, India, Thailand, the United States, Singapore, Indonesia, Australia, and Brunei.

The plan for the next SEANET convention is to hold it right here in DU-land. The organizers have eyed beautiful Cebu City as the host city. Cebu is about 600 miles south of Manila, and many domestic flights are available to Cebu City from Manila Domestic Airport. The tentative dates are November 22 through 24, and it is hoped that DU hams will be directly involved in this 15th SEANET convention.

Well, once again we will say 73 for now and hope to bring you another column soon and update you with the Hamvention 85 here in DU-land—and also share with you some pictures of the event. Good luck and happy DXing.

PROPAGATION

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA								15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40			20	15	15	15	15	
SOUTH AFRICA									15	15	15	
U. S. S. R.							20	20				
WEST COAST			80	80	40	40	40	20	20	20		

CENTRAL UNITED STATES TO:

ALASKA	20	20						15				
ARGENTINA										15	15	15
AUSTRALIA	15	20				40	20	20				15
CANAL ZONE	20	20	40	40	40	40			15	15	15	20
ENGLAND		40	40					20	20	20	20	
HAWAII	15	20	20	20	40	40	40					15
INDIA								20	20			
JAPAN								20	20			
MEXICO	20	20	40	40	40	40			15	15	15	20
PHILIPPINES								20	20			
PUERTO RICO	20	20	40	40	40	40			15	15	15	20
SOUTH AFRICA										15	15	20
U. S. S. R.								20	20			

WESTERN UNITED STATES TO:

ALASKA	20	20	20		40	40	40	40				15
ARGENTINA	15	20		40	40	40					15	15
AUSTRALIA		15	20	20			40	40				
CANAL ZONE			20	20	20	20	20	20				15
ENGLAND									20	20		
HAWAII	15	20	20	40	40	40	40					15
INDIA		20	20									
JAPAN	20	20	20			40	40	40			20	20
MEXICO			20	20	20	20	20					15
PHILIPPINES	15						40		20			
PUERTO RICO			20	20	20	20	20	20				15
SOUTH AFRICA										15	15	
U. S. S. R.									20			
EAST COAST		80	80	40	40	40	40	20	20	20		

G = Good, F = Fair, P = Poor.

MARCH

SUN	MON	TUE	WED	THU	FRI	SAT
						1 P
2 F	3 G	4 G	5 G	6 G	7 G-F	8 F
9 F	10 F-P	11 F	12 F-P	13 F-P	14 F-G	15 G
16 G-F	17 G-F	18 G	19 G	20 G	21 G	22 G
23 G-F	24 F-P	25 F-P	26 F	27 G	28 G	29 G
30 G	31 G					

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FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

TELEGRAPHY AND STUFF

As regular "Fun!" readers know, I don't think that a knowledge of the Morse code should be required of prospective radio amateurs.

Call me a radical, call me crazy, but I just don't see how an ability to use an obsolete form of binary communications is going to save our hobby.

Anyway, enough of that. It's time for a surprise. I actually love the code. I don't happen to think the Morse code should be crammed down the throats of newcomers, but I'm all in favor of using it on the air. Sending CW is fun, relaxing, and a great way to relive the historic past of radio. I like it. Call me duplicitous.

Last Christmas, my kid brother, WB2LWJ, gave me a great gift—a Vibroplex semi-automatic keyer (a.k.a.—"bug"). Best of all, it was a presentation model, the type with the gold-plated base.

What a Christmas! I was a kid again, prowling 20 meters for DX, engaging old friends in seemingly endless QSOs, and ditting and dahing away until my ears fairly rang with the sweet music of CW.

My brother tells me he got the keyer at Barry Electronics, a New York ham fixture and landmark. With Harrisons' death, Heathkit gone from the city, "radio row" replaced by the World Trade Center, and Lafayette now into discount VCRs and stereos instead of TR-4Cs and grounding rods, Barry's is the last vestige of a time when the Big Apple was the radio (both professional and amateur) capital of the world.

Anyway, when my brother showed up at Barry's to purchase the keyer, the folks behind the counter thought that 'LWJ was Mr. Fun! They believed that his denials were merely a form of KI2U modesty. How wrong they were. The real Mr. Fun!, although somewhat older, is far better looking than his brother. And KI2U is never modest about anything, except perhaps his ability to run a repeater.

But that's another story. For now, let's stick to CW and its ancestors.

ELEMENT 1
MULTIPLE CHOICE

1) Approximately how many parts are there to a typical Vibroplex bug?
   1) 10
   2) 20
   3) 50
   4) 100

2) Samuel Finley Breese Morse was born in:
   1) 1791
   2) 1815
   3) 1830
   4) 1840

3) Thomas Edison in 1874 created "quadruplex," which allowed a telegraph transmission of:
   1) one message in four directions
   2) two messages in two directions
   3) four messages in one direction
   4) one message in two directions

4) The early submarine telegraph indicated "dits" and "dahs" with the aid of:
   1) a sounder
   2) a deflecting needle
   3) a lamp
   4) an audio oscillator

5) In addition to his inventions, Morse is also particularly well known for having been:
   1) a painter of miniatures
   2) an acrobat
   3) a skilled violinist
   4) an author of romance novels

ELEMENT 2
TRUE-FALSE

	True	False
1) The spark transmitter of Hiram Percy Maxim W1AW was named "Ol' Reliable."	_____	_____
2) Morse's first telegraph link was between Baltimore and Philadelphia.	_____	_____
3) Morse's original telegraph receiver emitted a 10-kHz audio tone.	_____	_____
4) Morse was the first president of the National Academy of Design.	_____	_____
5) At one point, Morse held a chair in Natural Science at Yale.	_____	_____
6) Morse died in 1891.	_____	_____
7) Radio Telegraphy was introduced by Marconi in 1897.	_____	_____
8) Morse added an audio buzzer to his telegraph receiver in 1855.	_____	_____
9) The Vibroplex bug was invented by Horace G. Martin.	_____	_____
10) The first telegraph keys had no knob.	_____	_____

ELEMENT 3
SCRAMBLED WORDS

Unscramble these words relating to telegraphy:

praghyleet	romse	rekye	notedesi	gub
sift	pocy	eky	doce	idt

ELEMENT 4
FILL IN THE BLANK

1) _____ installed the first railway telegraph system in England in 1837.
2) Samuel F. B. Morse was born in the town of _____, _____.
3) First telegraph message: "What hath God _____"
4) The Morse code's "dit" and "dah" elements are separated by an interval that has the duration of _____ dit(s).
5) The "dah" has a duration equal to _____ dit(s).

THE ANSWERS

Element 1:
1—3, 2—1, 3—2, 4—2, 5—1.
Element 2:
1—False, "Old Betsy"
2—False, Between Baltimore and Washington
3—False, It printed "dits" and "dahs" on a slip of paper.
4—True, From 1826 to 1845, after which telegraphy increasingly occupied his time.
5—True, He was an instructor at New York University, located just a little north of Barry's.
6—False, 1872
7—True, And it sort of caught on.
8—False, Morse never did apply a buzzer or other sounding device to his invention. That honor went to a fellow named Alfred Vail.
9—True, Who else? Martin was a turn of the century telegraph operator who invented the bug to relieve arm strain. Many experienced ops thought the device a "sissy key," however. It took a while to catch on.
10—True, No "sissy key" ops back then.
Element 3:
Reading from left to right: telegraphy, Morse, keyer, sidetone, bug, fist, copy, key, code, dit
Element 4:
1—Sir Charles Wheatstone
2—Charleston MA
3—wrought
4—one
5—three

SCORING

Element 1:
Five points for each correct answer
Element 2:
Two and one-half points for each correct answer
Element 3:
Two and one-half points for each correct answer
Element 4:
Five points for each correct answer.

How did you do?

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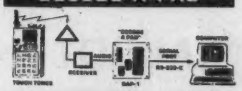

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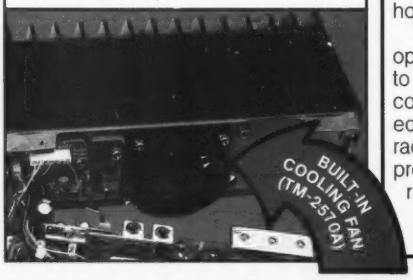

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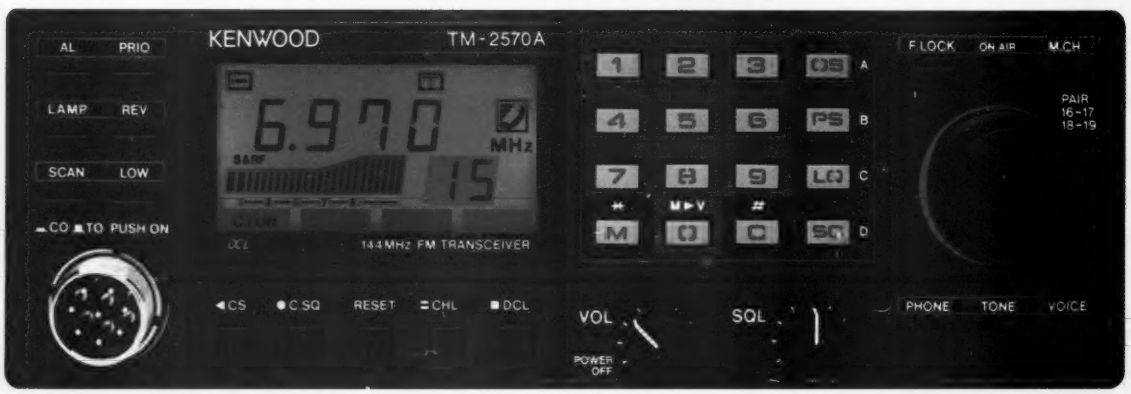

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